Synoptic Evaluation of Drinking Water Constituents of Concern in Sacramento and San Joaquin River Basins

Quality Assurance Project Plan

November 2014

A1, Element 1. Title and Approval Sheet

Program Title	Evaluation of MUN Beneficial Use in Agricultural Drains
Lead Organization	Central Valley Regional Water Quality Control Board Ag Regulatory and Planning Unit 11020 Sun Center Drive, #200 Rancho Cordova, CA 95670
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Effective Date	June 2014
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A3, Element 3. Distribution List

Central Valley Regional Water Quality Control Board (Central Valley Water Board) staff listed in Table 1 below will receive copies of this Quality Assurance Project Plan (QAPP) and any approved revisions of this plan. The QAPP plan will be available on the project website and to any interested party by requesting a copy from Cindy Au Yeung.

Table 1 Distribution List

Title:	Name (Affiliation):	E-Mail.:	No. of copies
Project Lead, Senior Environmental Scientist	Jeanne Chilcott (Central Valley Water Board)	jchilcott@waterboards.ca.gov	1
Monitoring Lead, Environmental Scientist	Cindy Au Yeung (Central Valley Water Board)	cindyauyeung@waterboards.ca.gov	1
Project Coordinator, Environmental Scientist	Anne Littlejohn (Central Valley Water Board)	alittlejohn@waterboards.ca.gov	1

A4, Element 4. Project/Task Organization

The June 2014 Synoptic Evaluation of Drinking Water Constituents of Concern in the Sacramento and San Joaquin River Basins study is being sponsored by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) in conjunction with the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative. The Municipal and Domestic Supply (MUN) Beneficial Use is defined as uses of water are for community, military, or individual water supply systems including, but not limited to, drinking water supply. The purpose of this study is to provide a snapshot of water quality within select agricultural (Ag) dominated drains and sites along the main stem of the Sacramento and San Joaquin Rivers against criteria developed to protect human health; specifically Title 22 primary and secondary Maximum Contaminant Limits (MCLs), California Toxics Rule (CTR), and other numeric water quality criteria listed in Table 3 for constituents without a MCL or CTR. Sampling of the study’s 11 sites will be conducted over two days, and each designated site will be sampled once for this study.

Sampling sites consist of:

- Locations that are utilized by other programs gathering water quality data
- Locations at representative agricultural drains
- Locations in the main river stems upstream and downstream of agricultural drain inflows

Table 2 identifies all personnel involved with this study. Descriptions of each person’s responsibilities follow the table.

Figure 1 shows relationships between personnel.

Involved parties and roles

Table 2 Personnel Responsibilities

Name	Organizational Affiliation	Title	Project Title/ Responsibility	Contact Information (Telephone number, fax number, email address.)
Jeanne Chilcott	Central Valley Water Board	Senior Environmental Scientist	Project Lead	Tel: 916 464 4788 Email: jchilcott@waterboards.ca.gov
Anne Littlejohn	Central Valley Water Board	Environmental Scientist	Project Coordinator	Tel: 916 464 4840 Email: alittlejohn@waterboards.ca.gov
Cindy Au Yeung	Central Valley Water Board	Environmental Scientist	Monitoring Lead	Tel: 916 464 4730 Email: cindyauyeung@waterboards.ca.gov
Vacant	Central Valley Water Board		QA Officer	

Quality Assurance Officer – Central Valley Water Board

The Quality Assurance Officer for the Central Valley Water Board works independently from the Monitoring Lead, field staff, and laboratory staff, and is responsible for ensuring that the data meets all quality objectives.

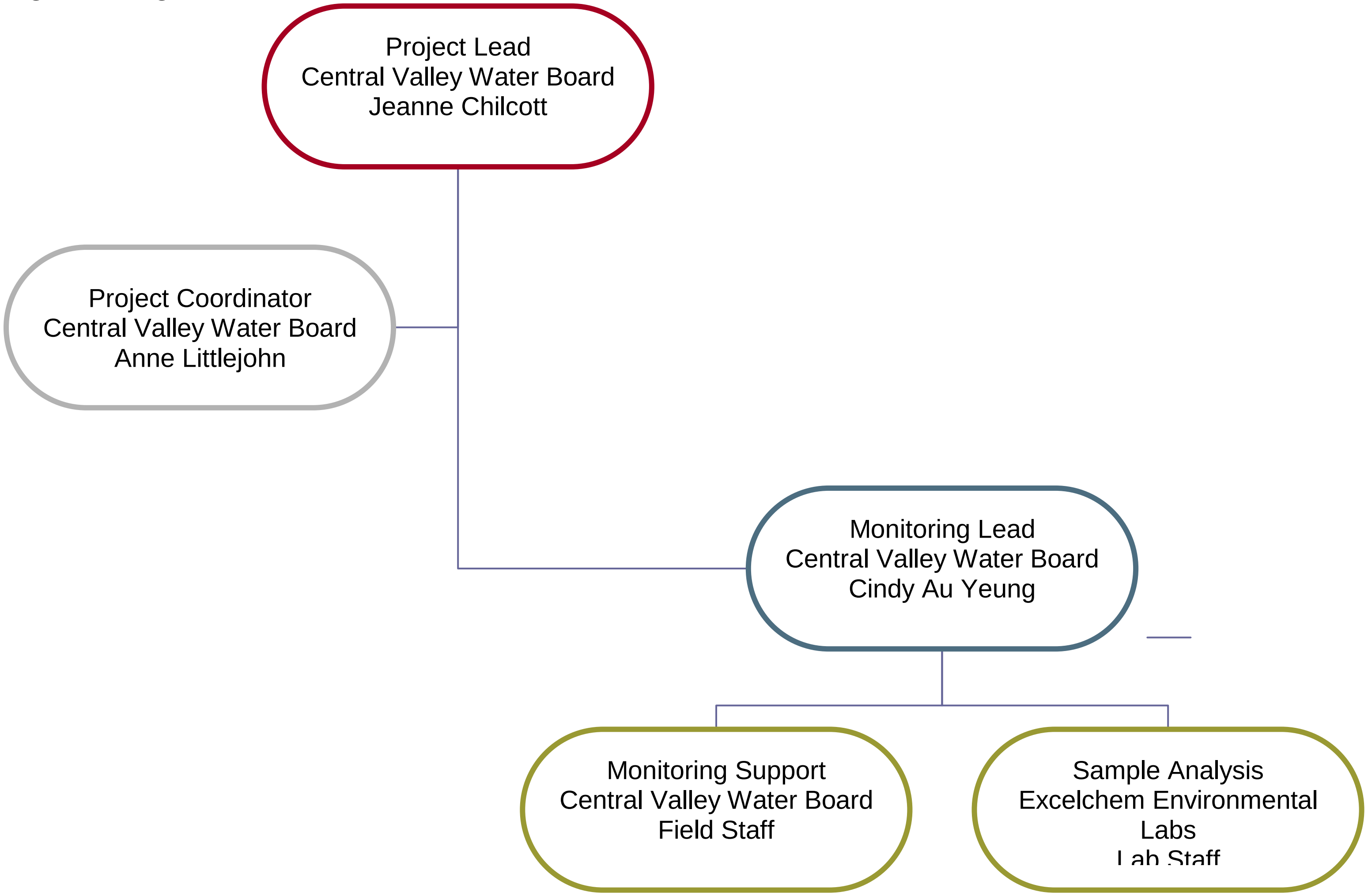
Field and Lab Personnel

Central Valley Water Board staff trained in sample collection will coordinate all field collection activities and collect the majority of water samples. Excelchem Environmental Lab personnel will conduct laboratory analyses.

Monitoring Lead – Central Valley Water Board

The Monitoring Lead will be responsible for maintaining the official and approved QA Project Plan.

Figure 1 Organizational Chart



A5, Element 5. Problem Statement/Background

Problem statement:

Please see Monitoring Plan in Appendix 3.

Via the State Water Resources Control Board Sources of Drinking Water Policy (88-63), the Central Valley Regional Water Quality Control Board Basin Plans (Basin Plans) designate the Municipal and Domestic Supply (MUN) beneficial use to all water bodies unless they are specifically listed as water bodies without MUN. The Basin Plans state that water bodies designated for MUN must not exceed MCLs for chemical constituents, pesticides, and radionuclides.

This project will provide a snapshot of the water quality within select agriculturally dominated drains and sites along the main stem of the San Joaquin and Sacramento Rivers as compared to criteria developed to protect human health.

The findings from this study may change how compliance for MUN will be enforced in new NPDES permits. Main goal of the monitoring is to determine:

Key Question

- During a one time snapshot of the irrigation period, do agricultural return flows exceed or cause the main stems of the Sacramento and/or San Joaquin Rivers to exceed potable water quality criteria?

Decisions or outcomes

The primary objectives of this monitoring project are:

- Collect representative samples in main agricultural drains discharging into either the Sacramento or San Joaquin Rivers and the rivers themselves;
- Determine spatial distribution of any detectible constituent concentrations of concerns; and,
- Identify whether criteria developed to protect human health are exceeded

Water quality or regulatory criteria

To evaluate whether water quality may be suitable for the MUN beneficial use, data will be compared to Maximum Contaminant Levels (MCLs) specified in provisions of Title 22 of the California Code of Regulations, California Toxics Rule (CTR) criteria, and other numeric water quality criteria listed in Table 3 for constituents without a MCL or CTR criteria. For constituents with both a MCL and CTR criteria, the most conservative numeric threshold will be selected for water quality evaluation. For constituents without a MCL and CTR criteria, the most appropriate numeric water quality criteria for protecting MUN beneficial use will be selected for water quality evaluation.

In addition, *E. coli* will be added to the monitoring effort and will be compared to the USEPA Recreational Guideline for Designated Beach Area at 235 MPN/100mL (USEPA, 1986). This numeric water quality criterion will be strictly used as a tool for evaluation to put values into context in terms of spatial and temporal trends.

Table 3 List of Potential Parameters of Concern

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
1,1,1-Trichloroethane	0.200 mg/L			1.0 mg/L [California Public Health Goal for Drinking Water]
1,1,2,2-Tetrachloroethane	0.001 mg/L		0.00017 mg/L	0.0001 mg/L [California Public Health Goal for Drinking Water]
1,1,2,Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2 mg/L			4.0 mg/L [California Public Health Goal for Drinking Water]
1,1,2-Trichloroethane	0.005 mg/L		0.0006 mg/L	0.0003 mg/L [California Public Health Goal for Drinking Water]
1,1-Dichloroethane	0.005 mg/L			0.003 mg/L [California Public Health Goal for Drinking Water]
1,1-Dichloroethylene	0.006 mg/L		0.000057 mg/L	0.010 mg/L [California Public Health Goal for Drinking Water]
1,2,4-Trichlorobenzene	0.005 mg/L			0.005 mg/L [California Public Health Goal for Drinking Water]
1,2,4-Trimethylbenzene				0.330 mg/L [California DPH Notification Level for drinking water]
1,2-Dibromo-3chloropropane (DBCP)	0.0002 mg/L			0.0000017 mg/L [California Public Health Goal for Drinking Water]
1,2-Dibromoethane (Ethylene Dibromide) (EDB)	0.00005 mg/L			0.00001 [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
1,2-Dichlorobenzene	0.6 mg/L		2.7 mg/L	0.6 mg/L [California Public Health Goal for Drinking Water]
1,2-Dichloroethane (Ethylene dichloride)	0.005 mg/L		0.00038 mg/L	0.0004 mg/L [California Public Health Goal for Drinking Water]
1,2-Dichloropropane	0.005 mg/L		0.00052 mg/L	0.00050 mg/L [California Public Health Goal for Drinking Water]
1,2-Diphenylhydrazine			0.000040 mg/L	
1,3 Dichlorobenzene			0.400 mg/L	0.600 mg/L [California DPH Notification Level for drinking water]
1,3,5-Trimethylbenzene				0.330 [California DPH Notification Level for drinking water]
1,3-Dichloropropene	0.0005 mg/L		0.01 mg/L	0.0002 mg/L [California Public Health Goal for Drinking Water]
1,4-Dichlorobenzene	0.005 mg/L		0.400 mg/L	0.006 mg/L [California Public Health Goal for Drinking Water]
2,3,7,8-TCDD (Dioxin)	3 x 10-8 mg/L		1.3 x 10-11 mg/L	5 x 10-11 mg/L [California Public Health Goal for Drinking Water]
2,4,5-TP (Silvex)	0.05 mg/L			0.002 mg/L [California Public Health Goal for Drinking Water]
2,4,6-Trichlorophenol			0.0021 mg/L	
2,4-Dichlorophenol			0.093 mg/L	
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07 mg/L			0.02 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
2,4-Dichlorophenoxybutyric acid (2,4-DB)				0.056 mg/L [USEPA IRIS Reference Dose]
2,4-Dimethylphenol			0.540 mg/L	
2,4-Dinitrophenol			0.070 mg/L	
2,4-Dinitrotoluene			0.00011 mg/L	
2-Chloronaphthalene			1.7 mg/L	
2-Chlorophenol			0.120 mg/L	
2-Methyl-4,6-Dinitrophenol			0.0134 mg/L	
3,3'-Dichlorobenzidine			0.00004 mg/L	
4,4'-DDD			0.00000083 mg/L	0.00015 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
4,4'-DDE			0.00000059 mg/L	0.0001 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
4,4'-DDT			0.00000059 mg/L	0.0001 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Acenaphthene			1.2 mg/L	0.020 mg/L [USEPA National Recomm. WQ Criteria, taste & odor

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Acrolein			0.320 mg/L	0.110 mg/L [Odor threshold (Amoore and Hautala)]
Acrylonitrile			0.000059 mg/L	
Alachlor	0.002 mg/L			0.004 mg/L [California Public Health Goal for Drinking Water]
Aldrin			0.00000013 mg/L	0.0000021 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Alpha-BHC (alpha-Benzene hexachloride)			0.0000039 mg/L	0.000013 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Aluminum	1.0 mg/L	0.2 mg/L		0.600 mg/L [California Public Health Goal for Drinking Water]
Ammonia				1.5 mg/L [Odor threshold (Amoore and Hautala)]
Anthracene			9.6 mg/L	
Antimony	0.006 mg/L		.0014 mg/L	0.020 mg/L [California Public Health Goal for Drinking Water]
Arsenic	0.010 mg/L			0.000004 mg/L [California Public Health Goal for Drinking Water]
Asbestos	7 Million Fibers per Liter		7 Million Fibers/Liter	

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Atrazine	0.001 mg/L			0.00015 mg/L [California Public Health Goal for Drinking Water]
Barium	1.0 mg/L			2.0 mg/L [California Public Goal for Drinking Water]
Bentazon	0.018 mg/L			
Benzene	0.001 mg/L		0.0012 mg/L	0.00015 mg/L [California Public Health Goal for Drinking Water]
Benzidine			0.00000012 mg/L	
Benzo(a)Anthracene [1,2-Benzanthracene]			0.0000044 mg/L	0.000029mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Benzo(a)pyrene	0.0002 mg/L		0.0000044 mg/L	0.000007mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Benzo(b)Fluoranthene [3,4-Benzofluoranthene]			0.0000044 mg/L	0.000029mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Benzo(k)Fluoranthene			0.0000044 mg/L	0.000029mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Beryllium	0.004 mg/L			0.001 mg/L [California Public Health Goal for Drinking Water]
Beta/photon emitters	4 millirem/year annual dose equivalent to the total body or any internal organ			
Beta-BHC (beta-Benzene hexachloride)			0.000014 mg/L	0.000023 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Bis(2-Chloroethyl)Ether			0.000031 mg/L	
Bis(2-Chloroisopropyl)Ether			1.400 mg/L	
Boron				1 mg/L [California Public Health Goal for Drinking Water]
Bromoform			0.0043 mg/L	0.004 mg/L USEPA IRIS Cancer Risk Level
Butylbenzyl Phthalate			3.0 mg/L	
Cadmium	0.005 mg/L			0.00004 mg/L [California Public Health Goal for Drinking Water]
Carbofuran	0.04 mg/L			

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Carbon Tetrachloride	0.0005 mg/L			0.00025 mg/L [National Toxics Rule (NTR) for sources of drinking water]
Chlordane	0.0001 mg/L		0.00000057 mg/L	0.00003 mg/L [California Public Health Goal for Drinking Water]
Chloride		250 mg/L		
Chlorobenzene	0.070 mg/L		0.680 mg/L	
Chlorodibromomethane			0.00041 mg/L	
Chloroform				0.0018 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Chlorpyrifos				0.002 mg/L [USEPA, OPP Drinking Water Health Advisory - non-cancer]
Chromium	0.05 mg/L			
Chrysene			0.0000044 mg/L	0.00029 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Cis1,2-Dichloroethylene	0.006 mg/L			0.100 mg/L [California Public Health Goal for Drinking Water]
Color		15 Units		
Copper		1.0 mg/L	1.3 mg/L	0.300 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Cyanide	0.15 mg/L		0.700 mg/L	0.150 mg/L [California Public Health Goal for Drinking Water]
Dalapon	0.2 mg/L			0.790 mg/L [California Public Health Goal for Drinking Water]
Di(2-ethylhexyl)adipate	0.4 mg/L			
Di(2-ethylhexyl)phthalate (DEHP) (Bis(2-ethylhexyl) phthalate)	0.004 mg/L			0.0018 mg/L [National Toxics Rule (NTR) for sources of drinking water]
Diazinon				0.0012 mg/L [CDPH Notification Level for drinking water]
Dibenzo(ah)Anthracene			0.0000044 mg/L	0.0000085 [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Dichlorobromomethane			0.00056 mg/L	0.00027 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Dichloromethane (Methylene Chloride)	0.005 mg/L		0.0047 mg/L	0.0004 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Dieldrin			0.00000014 mg/L	0.0000022 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Diethyl Phthalate			23 mg/L	
Di-isopropyl ether (Isopropyl ether) (DIPE)				0.0008 mg/L [Odor threshold (Amoore and Hautala)]
Dimethyl Phthalate			313 mg/L	
Di-n-Butyl Phthalate			2.7 mg/L	
Dinoseb	0.007 mg/L			0.014 mg/L [California Public Health Goal for Drinking Water]
Diquat	0.02 mg/L			
E. coli				235 MPN/100 mL [USEPA Recreational Guideline for Designated Beach Area (Upper 75% confidence level)]
Endosulfan I (Alpha-Endosulfan)			0.110 mg/L	0.042 mg/L [USEPA IRIS Reference Dose]
Endosulfan II (Beta-Endosulfan)			0.110 mg/L	0.042 mg/L [USEPA IRIS Reference Dose]
Endosulfan Sulfate	0.002 mg/L		0.110 mg/L	
Endothall	0.1 mg/L			
Endrin	0.002 mg/L		0.00076 mg/L	0.0018 mg/L [California Public Health Goal for Drinking Water]
Endrin Aldehyde			0.00076 mg/L	

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Ethylbenzene	0.3 mg/L		3.1 mg/L	0.0032 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Fluoranthene			0.3 mg/L	0.280 mg/L [USEPA IRIS Reference Dose]
Fluorene			1.3 mg/L	0.280 mg/L [USEPA IRIS Reference Dose]
Fluoride		2.0 mg/L		1.0 mg/L [California Public Health Goal for Drinking Water]
Foaming Agents (MBAS)		0.5 mg/L		
Gamma-BHC (gamma-Benzene hexachloride) (Lindane)	0.0002 mg/L		0.000019 mg/L	0.000032 mg/L [California Public Health Goal for Drinking Water)
Glyphosate	0.7 mg/L			
Gross Alpha particle activity (excluding radon and uranium)	15 pCi/L			
Heptachlor	0.0004 mg/L		0.00000021 mg/L	0.000008 mg/L [California Public Health Goal for Drinking Water]
Heptachlor Epoxide	0.0002 mg/L		0.00000010 mg/L	
Hexachlorobenzene	0.001 mg/L		0.00000075 mg/L	
Hexachlorobutadiene			0.00044 mg/L	
Hexachlorocyclopentadiene	0.05 mg/L		0.240 mg/L	
Hexachloroethane			0.0019 mg/L	

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Indeno(1,2,3-cd) Pyrene			0.0000044 mg/L	0.000029 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Iron		0.3 mg/L		
Isophorone			0.0084 mg/L	
Lead	0.015 mg/L			0.0002 mg/L California Public Health Goal for Drinking Water]
Manganese		0.05 mg/L		0.500 mg/L [California DPH Notification Level for drinking water]
Mercury	0.002 mg/L		0.000050 mg/L	0.0012 mg/L [California Public Health Goal for Drinking Water]
Methoxychlor	0.03 mg/L			0.00009 mg/L [California Public Health Goal for Drinking Water]
Methyl Bromide (Bromomethane)			0.048 mg/L	
Methyl-tert-butyl ether (MTBE)	0.013 mg/L	0.005 mg/L		0.013 mg/L [California Public Health Goal for Drinking Water]
Molinate	0.02 mg/L			
Monochlorobenzene	0.1 mg/L			
Nickel	0.100 mg/L		0.61 mg/L	0.012 mg/L [California Public Health Goal for Drinking Water]
Nickel	0.1 mg/L		0.610 mg/L	0.012 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Nitrate (as NO3)	45 mg/L			
Nitrate+Nitrite (sum as nitrogen)	10 mg/L			
Nitrite (as Nitrogen)	1.0 mg/L			
Nitrobenzene			0.017 mg/L	
N-Nitrosodimethylamine (NDMA)			0.00000069 mg/L	0.000003 mg/L [California Public Health Goal for Drinking Water]
N-Nitrosodi-n-Propylamine			0.000005 mg/L	
N-Nitrosodiphenylamine			0.005 mg/L	
Odor		3 TON (Threshold Odor Number)		
Oxamyl	0.2 mg/L			
Pentachlorophenol	0.001 mg/L		0.00028 mg/L	0.0003 mg/L [California Public Health Goal for Drinking Water]
Perchlorate	0.006 mg/L			0.006 mg/L [California Public Health Goal for Drinking Water]
pH		6.5 - 8.5		
Phenol			21.0 mg/L	
Picloram	0.5 mg/L			
Polychlorinated Biphenyls (PCBs)	0.0005 mg/L		0.00000017 mg/L	0.00009 mg/L California Public Health Goal for Drinking Water]
Pyrene			0.960 mg/L	0.210 mg/L [USEPA IRIS Reference Dose]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Radium-226	5 pCi/L (combined radium-226 & -228)			
Radium-228	5 pCi/L (combined radium-226 & -228)			
Selenium	0.05 mg/L			0.03 mg/L [California Public Health Goal for Drinking Water]
Silver		0.1 mg/L		0.035 mg/L [USEPA IRIS Reference Dose]
Simazine	0.004 mg/L			
Sodium				20 mg/L [USEPA Drinking Water Advisory (for persons on restricted sodium diet)]
Specific Conductance		900 µS/cm		
Strontium-90	8 pCi/L (=4 millirem/yr. dose to bone marrow)			
Styrene	0.1 mg/L			
Sulfate		250 mg/L		
Tetrachloroethylene (Tetrachloroethene) (PCE)	0.005 mg/L		0.0008 mg/L	0.0006 mg/L [California Public Health Goal for Drinking Water]
Thallium	0.002 mg/L		0.0017 mg/L	0.0001 mg/L [California Public Health Goal for Drinking Water]
Thiobencarb	0.07 mg/L	0.001 mg/L		
Toluene	0.15 mg/L		6.800 mg/L	0.150 [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Total Dissolved Solids		500 mg/L		
Total Triahlomethanes	0.080 mg/L			
Toxaphene	0.003 mg/L		0.00000073 mg/L	0.00003 mg/L [California Public Health Goal for Drinking Water]
Trans-1,2-Dichloroethylene	0.01 mg/L		0.700 mg/L	0.00060 mg/L [California Public Health Goal for Drinking Water]
Trichloroethylene (TCE)	0.005 mg/L		0.0027 mg/L	0.0017 mg/L [California Public Health Goal for Drinking Water]
Trichlorofluoromethane (Freon 11)	0.15 mg/L			1.3 mg/L [California Public Health Goal for Drinking Water]
Tritium	20000 pCi/L (=4 millirem/yr. dose to total body)			
Turbidity		5 NTU		
Uranium	20 pCi/L			
Vanadium				0.050 mg/L [California DPH Notification Level for drinking water]
Vinyl Chloride	0.0005 mg/L		0.002 mg/L	0.00005 mg/L [California Public Health Goal for Drinking Water]
Xylenes	1.750 mg/L			1.80 mg/L [California Public Health Goal for Drinking Water]
Zinc		5.0 mg/L		2.1 mg/L [USEPA IRIS Reference Dose]

NOTE: Not all of the analytes listed above were analyzed for this study.

A6, Element 6. Project/Task Description

Work statement and produced products

This project will determine if agricultural return flows exceed or cause the main stems of the Sacramento and/or San Joaquin Rivers to exceed MCLs specified in provisions of Title 22 of the California Code of Regulations, CTR criteria, and other numeric water quality criteria during the irrigation period. The water quality data will be compared to all drinking water criteria as part of an evaluation of potential MUN beneficial uses.

Constituents to be monitored and measurement techniques

Field measurements for DO, SC, pH, and temperature will be collected using a YSI EXO 1 Sonde (Sonde). Turbidity measurements will be collected using a portable Hach 2100P turbidimeter. Photo documentation at all monitoring sites will be conducted when collecting field measurements.

Samples will also analyze for all MCLs specified in Title 22 of the California Code of Regulations, except for asbestos and radionuclides. In addition, select constituents with human health criteria in the California Toxics Rule (CTR) will be analyzed, as well as *E. coli* which has been identified as a trigger for possible reductions in pathogen levels by the California Department of Public Health (CDPH). Analyses will be conducted at Excelchem utilizing the following methods:

EPA method 200.7:
This method will be used to analyzed hardness, barium, antimony, beryllium, cadmium, chromium, nickel, copper, silver, zinc, selenium, boron, sodium, total aluminum, total iron, and total manganese by inductively coupled plasma – mass spectrometry (ICP MS). This method is used for determination of dissolved elements and total recoverable element concentrations in surface waters, drinking water, and wastewaters.

EPA method 200.9:
This method will be used to analyze total lead and thallium by stabilized temperature graphite furnace atomic absorption. This method is used for determination of total recoverable elements in surface water, drinking water, storm runoff, industrial and domestic wastewater.

EPA method 300:
This method will be used to analyze sulfate, chloride, total fluoride, nitrate as nitrogen and nitrite as nitrogen by ion chromatography. This method is used on drinking water, surface water, mixed domestic and industrial wastewaters.

EPA method 5540C:
This method will be used to analyze MBAs, or foaming agents, by observing the intensity of the cationic dye through ion pair formation. This method is used for drinking water samples.

EPA method 8260B:
This method will be used to analyze volatile organic compounds by gas chromatography/mass spectrometry (GC/MS) in surface water. Organohalides, particularly the trihalomethanes, are present in most chlorinated water systems; especially those using surface waters as a water source.

EPA method 8151A:
This method will be used to analyze chlorinated herbicides by capillary gas chromatography (GC) in surface water.

EPA method 8141A:
This method will be used to analyze organo-phosphorus pesticides by capillary gas chromatography (GC) in surface water.

EPA method 8082A:
This method will be used to analyze polychlorinated biphenyls by capillary gas chromatography (GC) in surface water.

EPA method 8290:
This method will be used to analyze polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans by high-resolution gas chromatography and high-resolution mass spectrometry (HRGC/HRMS) on purified sample extracts of surface water.

EPA method 8318:
This method will be used to analyze carbamate pesticides by high performance liquid chromatography (HPLC) in surface water.

EPA method 8081A:
This method will be used to analyze organo-chlorinated herbicides by capillary gas chromatography (GC) in surface water.

EPA method 8270C:
This method will be used to analyze semivolatile organic compounds by gas chromatography/mass spectrometry (GC/MS) on purified sample extracts of surface water.

EPA method 2540:
This method will be used to analyze total dissolved solids by drying in an oven at a defined temperature using a filter on surface water samples.

EPA method 350.2:
This method will be used to analyze ammonia as nitrogen by distillation of the surface water.

EPA method 206.3
This method will be used to analyze total arsenic by gaseous hydride generation – atomic absorption in drinking water.

Project schedule

The project schedule is outlined in Table 4.

Table 4 Project Schedule

Date	***Activity***
June 25, 2014	*Field Sampling (Sacramento River Basin)*
June 25-August 4, 2014	*Lab Analysis*
June 30, 2014	*Field Sampling (San Joaquin River Basin)*
June 30-August 5, 2014	*Lab Analysis*

Geographical setting

The Central Valley Regional Water Quality Control Plan (Basin Plan) covers the entire area included in the Sacramento River and San Joaquin River drainage basins. The basins are bound by the crests of the Sierra Nevada on the east and the Coast Range and Klamath Mountains on the west. The Sacramento River and San Joaquin River Basins cover about one fourth of the total area of the State and over 30% of the State's irrigable land. The Sacramento and San Joaquin Rivers furnish roughly 51% of the State's water supply. Surface waters from the two drainage basins meet and form the Delta, which ultimately drains to San Francisco Bay.

The selected areas of this monitoring study are located within the Sacramento and San Joaquin River Basins. The Colusa Basin Drain and Sutter Bypass are not designated with the MUN beneficial use in Table II-1 in the Basin Plan. The Colusa Basin Drain and Sutter Bypass both flow into the Sacramento River, which does have the MUN beneficial use. A map of the study area can be found on Figure 2 of the Monitoring Plan.

The Sacramento River Basin covers 27,210 square miles and includes the entire area drained by the Sacramento River. The Sacramento River is the largest river in the watershed, with an annual average stream flow volume of 22 million acre-feet. All watersheds tributary to the Sacramento River north of the Cosumnes River watershed and the closed basin of Goose Lake and drainage sub-basins of Cache and Putah Creeks are included in the Sacramento River Basin.

The San Joaquin River Basin covers 15,880 square miles and includes the entire area drained by the San Joaquin River. It includes all watersheds tributary to the San Joaquin River and south of the American River watershed. The San Joaquin River is the principal drainage system of the San Joaquin Valley, with an annual surface runoff of about 1.6 million acre-feet. Major tributaries to the San Joaquin River include the Consumnes, Calaveras, Stanislaus, and Merced Rivers. Flows from the west side of the river basin are dominated by agricultural return flows.

Further description of the study area can be found in the monitoring plan located at:
http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr.pdf

Constraints

The primary constraints for this project are personnel, funding, and logistics. Other constraints may be identified throughout the course of the study.

Personnel: Only two Central Valley Water Board staff are currently available for monitoring. The limited availability of staff limits the number of sites that can be monitored and the frequency of monitoring.

Funding: The current budget leftover from the 18-month Sacramento Case Study was estimated to be $30,000. Monitoring duration and sites will be restricted to one day sampling in the Sacramento River and San Joaquin River Basin at a total of 11 sites.

Logistics: Logistical constraints include hold times. The sampling sites are 2 to 3 hours from the Central Valley Water Board's closest contracted laboratory. The shortest hold time is 48 hours for Nitrate as Nitrogen, Nitrite as Nitrogen, and MBAs. The Volatile Organic Compound scan has a hold time of 14 days. Boron, total iron, sodium, total aluminum, total arsenic, and total manganese have hold times of 6 months. Once sampling concludes for the day, the samples will be transported to Excelchem Environmental Labs.

A7, Element 7. Quality Objectives and Criteria for Measurement Data

Measurement Quality Objectives

This section contains the measurement quality objectives of this study and includes analyses in the field. Data quality indicators for this study will consist of the following:

Measurement or Analysis Type	Applicable Data Quality Objective
Field Measurements (DO, SC, pH, Temp, turbidity)	Accuracy, Precision, Completeness
Boron, sodium, nitrate as nitrogen, nitrite as nitrogen, volatile organic compounds, MBAs; Total: iron, aluminum, fluoride, arsenic, manganese, barium, lead, antimony, beryllium, cadmium, nickel, thallium, copper, silver, zinc, selenium; *E.* coli, total dissolved solids, ammonia as nitrogen, hardness, sulfate, chloride, chlorinated herbicides, organo-phosphorus pesticides, PCB's, dioxin, carbamate pesticides, organochlorine pesticides, and semi-volatile organic compounds.	Accuracy, Precision, Contamination, Completeness

There are two types of quality objectives. Measurement Quality Objectives (MQOs) refer to the quality of a given measurement (e.g. accuracy or precision). The Data Quality Objectives (DQOs) refer to the ability of an entire data set to provide answers to a study question (e.g. completeness or representativeness).

DQOs for the proposed project will be based on MQOs for the analytes listed in Table 5. All monitoring data obtained will be kept in Excel files in order to make reviews easier. The data will eventually be loaded into the California Environmental Data Exchange Network (CEDEN) as resources become available.

The MQOs for field measurements are listed in Table 5.

Additional MQOs for data acceptability, test conditions, water chemistry, and sample handling are listed in Appendix A of the SWAMP QAPP.

MQOs for the equipment used to measure water temperature, dissolved oxygen, specific conductivity, pH, and turbidity in this project are detailed in Table 5. With proper calibration, the range, accuracy, and resolution of each instrument will meet the manufacturer's specifications and meet the MQOs for individual parameters. These parameters are detailed in 7.1 through 7.6.

Accuracy

Accuracy is the relationship between a measurement of a known concentration against a measured value. Accuracy is measured by determining the percent recovery of known concentrations of analytes spiked into field sample or reagent water before extraction. This is a laboratory quality assurance that Excelchem Environmental Labs will perform while analyzing water samples.

Precision

Precision is a Data Quality Indicator (DQI) that measures the variability of repeated measurements of the same parameter in the same sample under the same analytical condition. Precision measurements are determined by field and laboratory duplicate samples, and will be evaluated by having the same analyst complete the procedure for duplicate field samples or laboratory duplicates. Our expectation is that duplicate samples will be ≥80% concordant (i.e., ≥80% agreement between pairs of samples).

YSIs will be used in this study, which automatically take multiple measurements and display an average of the results. Where these types of instruments are used, replicate readings are not necessary. For turbidity, samples will be collected and results recorded in triplicate.

Replicates will be collected for field measurements at 2 of the 11 total sites. Analytical precision for key constituent analysis will be evaluated at a frequency of 5% of the total samples for the project for field duplicates for each key constituent.

Contamination

Contamination is the unintentional addition of analytical constituents to a sample or system. To test for contamination during sample transport, a travel blank for each key constituent will be transported with field samples. Travel blanks for each key constituent will be analyzed at a frequency of 5% of the total samples for the project. Laboratory blanks are analyzed per analytical batch.

Comparability

Comparability is the degree to which data can be compared directly to data from similar studies.

Methods for field parameters and key constituents are either EPA approved methods or are found in Standard Methods.

Completeness

Completeness is the fraction of planned data that must be collected in order to fulfill the statistical criteria of the project. It is expected that 90% of field measurements and analysis of key constituents will be taken. This accounts for adverse weather conditions, safety concerns, and equipment problems. Central Valley Water Board staff will determine completeness by comparing the number of measurements that were planned to be collected against the number of measurements that were actually collected that were also deemed valid. No analysis at a “dry” site will be considered a “sample” since part of the effort is to characterize the hydrology of the water bodies. An invalid measurement would be one that does not meet the sampling method requirements and the data quality objectives. Completeness results will be checked for each sampling season. This will allow Central Valley Water Board staff to identify and correct problems.

Representativeness

Representativeness describes the relevance of data to the actual environmental condition. Bias or lack of representativeness can occur if:

- Samples are taken in a stream reach that fails to describe the area of interest;
- Samples are collected in an unusual location (For example: a stagnant pool instead of the flowing portion of the water body);
- Samples are not preserved, stored, or analyzed appropriately, causing the condition of the sample to change

Representativeness and resulting bias are addressed through the overall sampling design. Sites were selected to characterize receiving waters and where hold times could be met. Sample collection specifications are described in Appendix 5.

Method Detection Limit and Sensitivity

The Method Detection Limit (MDL) is the lowest possible concentration that the instrument or equipment that is analyzing a given sample can detect. It is important to record MDLs of any pollutants analyzed for because it cannot be determined that a pollutant was not present, only that it could not be detected.

Sensitivity is the ability of the instrument to detect one concentration from the next. Sensitivities (Target Reporting Limits) for field data and lab data are noted in Table 5.

Table 5 Measurement Quality Objectives

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Central Valley Regional Board								
Field Testing (YSI EXO 1)	Dissolved Oxygen	1%	0.1% air sat.	NA	0.01 mg/L	Saturated air	Each sampling event	90%
Field Testing (YSI EXO 1)	pH	+0.1 pH units	0.01 units	NA	NA	Buffer solutions pH 4, 7, and 10	Each sampling event	90%
Field Testing (YSI EXO 1)	Specific Conductance	±0.5% of reading or ±0.001 mS/cm	0.0001 to 0.01 mS/cm (range-dependent)	NA	0.001 µS/cm	1000 uS/cm standard	Each sampling event	90%
Field Testing (YSI EXO 1)	Water temperature	-5 to 35°C: +0.01°C	0.001°C	NA	NA	Not required	Not required	90%
Field Testing (Hach 2100P)	Turbidity	+ 2% of reading or 0.3 NTU, whichever is greater	0.1 NTU	NA	0 to 1,000NTU	StablCal 2100P	Each sampling event	90%
Laboratory Analysis	Total Coliform and E. coli	P/A	Lab and Field duplicate samples, per SM	Field blank <1	1	NA	NA	90%

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Excelchem Lab								
Laboratory Analysis	Ammonia as Nitrogen	Laboratory Control Spike 80-120% REC	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) RPD <25	Lab Blank <RL	0.100 mg/L	NA	NA	90%
Laboratory Analysis	Boron	Laboratory Control Spike 85-115% REC	MS and MSD RPD < 25	Lab Blank <RL	50.0 µg/L	NA	NA	95%
Laboratory Analysis	Bromodichloromethane	Laboratory Control Spike 70-130% REC	MS and MSD RPD <15	Lab Blank <RL	0.5 µg/L	NA	NA	95%
Laboratory Analysis	Bromoform	Laboratory Control Spike 70-130% REC	MS and MSD RPD <15	Lab Blank <RL	0.5 µg/L	NA	NA	95%
Laboratory Analysis	Chloride	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	500 µg/L	NA	NA	90%
Laboratory Analysis	Chlorinated Herbicide	Laboratory Control Spike 50-150% REC	MS and MSD RPD <25	Lab Blank <RL	0.5 to 2.0 µg/L	NA	NA	90%

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Laboratory Analysis	Chloroform	Laboratory Control Spike 70-130% REC	MS and MSD RPD <15	Lab Blank <RL	0.5 µg/L	NA	NA	95%
Laboratory Analysis	Dibromochlorometh ane	Laboratory Control Spike 70-130% REC	MS and MSD RPD <15	Lab Blank <RL	0.5 µg/L	NA	NA	95%
Laboratory Analysis	Dioxin/Furan by HRMS	Laboratory Control Spike 50-150% REC	MS and MSD RPD <25	Lab Blank <RL	10-100 pg/L	NA	NA	90%
Laboratory Analysis	Hardness	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.00 mg/L	NA	NA	90%
Laboratory Analysis	MBAs	Laboratory Control Spike 90-110% REC	Laboratory Control Spike (LCS) and LCS Dup RPD <15	Lab Blank <RL	0.100 mg/L	NA	NA	95%
Laboratory Analysis	Nitrate as Nitrogen	Laboratory Control Spike 80-120% REC	Lab Duplicate RPD <20	Lab Blank <RL	0.11 mg/L	NA	NA	90%
Laboratory Analysis	Nitrite as Nitrogen	Laboratory Control Spike 80-120% REC	Lab Duplicate RPD <20	Lab Blank <RL	0.15 mg/L	NA	NA	90%

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Laboratory Analysis	Polychlorinated Biphenyls (PCBs)	Laboratory Control Spike 50-150% REC	MS and MSD RPD <25	Lab Blank <RL	1.0 µg/L	NA	NA	90%
Laboratory Analysis	Semi-volatiles by GC/MS	Laboratory Control Spike 50-150% REC	MS and MSD RPD <25	Lab Blank <RL	2.0-30.0 µg/L	NA	NA	90%
Laboratory Analysis	Sodium	Laboratory Control Spike 85-115% REC	MS and MSD RPD < 20	Lab Blank <RL	400 µg/L	NA	NA	95%
Laboratory Analysis	Sulfate	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5000 µg/L	NA	NA	90%
Laboratory Analysis	Total Aluminum	Laboratory Control Spike 85-115% REC	LCS and LCS Dup RPD < 20	Lab Blank <RL	50.0 µg/L	NA	NA	95%
Laboratory Analysis	Total Antimony	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	10.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Arsenic	Laboratory Control Spike 85-115% REC	LCS and LCS Dup RPD < 20	Lab Blank <RL	10.0 µg/L	NA	NA	95%

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Laboratory Analysis	Total Barium	Laboratory Control Spike 80-120% REC	MS and MSD RPD < 25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Beryllium	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Cadmium	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Chromium	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Copper	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Dissolved Solids	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	15.0 mg/L	NA	NA	90%
Laboratory Analysis	Total Fluoride	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	100 µg/L (detection limit)	NA	NA	90%

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Laboratory Analysis	Total Iron	Laboratory Control Spike 85-115% REC	MS and MSD RPD < 20	Lab Blank <RL	20.0 µg/L	NA	NA	95%
Laboratory Analysis	Total Lead	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Manganese	Laboratory Control Spike 85-115% REC	MS and MSD RPD < 20	Lab Blank <RL	10.0 µg/L	NA	NA	95%
Laboratory Analysis	Total Nickel	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Selenium	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	20.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Silver	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	5.0 µg/L	NA	NA	90%
Laboratory Analysis	Total Thallium	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	20.0 µg/L	NA	NA	90%

Sample Type	Parameter	Accuracy	Precision	Recovery/ Sensitivity	Target Reporting Limit	Calibration	Calibration Interval	Complete-ness
Laboratory Analysis	Total Zinc	Laboratory Control Spike 80-120% REC	MS and MSD RPD <25	Lab Blank <RL	10.0 µg/L	NA	NA	90%

A8, Element 8. Special Training Needs/Certification

Specialized training or certifications

No specialized training or certifications are required for field staff for this project. The California Department of Public Health has certified Excelchem Environmental Labs. The QA officer for Excelchem lab is responsible for overseeing training of lab staff to achieve and maintain high standards of quality.

All staff involved will be familiar with the field guidelines, fully trained in the Rinsing Technique and Sample Collection method of water sample collection, and procedures as outlined in the Sample Procedures Manual (Appendix 13). If necessary, additional training will be provided by Central Valley Water Board staff.

Field staff will be required to review the SWAMP training manuals on field measurements and water sampling techniques, sample processing procedures, and the procedures outlined in Appendices 3 – 13 of this QAPP, as needed.

Training personnel

Central Valley Water Board staff is trained annually on field procedures. Training is overseen by program managers who are responsible for their area of expertise.
Training records for Central Valley Water Board staff are maintained at the Central Valley Water Board office. Laboratory safety manual and safety training records are maintained in the Central Valley Water Board's main lab.

A9, Element 9. Documents and Records

Documents and records generated from this project will be organized and stored in compliance with this QAPP. This will allow for future retrieval, and for specifying the location and holding times of all records.

QAPP updates and distribution

All originals of the first and subsequent amended QAPPs will be held at the Central Valley Water Board office by the Monitoring Lead. The Monitoring Lead will be responsible for the distribution of the QAPP and posting to the project website. Any future amended QAPPs will be held and distributed.

Records to be included in data reports

Data reports for each sampling event will include field data, laboratory data, chain of custody forms, and associated QA reports.

All field data will be recorded at the time of completion, using the field data sheet (see Appendix 8).

Samples being sent to the Excelchem Environmental Labs in Rocklin, CA will include a Chain of Custody (CoC) form (Appendix 10). The laboratory will generate records for sample receipt and storage, analyses and reporting. All records will be delivered to the Central Valley Water Board Monitoring Lead, Cindy Au Yeung, within 45 days of sample submission.

Persons responsible for maintaining records

The Monitoring Lead will maintain the project file, to include the original QAPP and Monitoring Plan, and subsequent revisions. The project file will also contain correspondence regarding decisions made, data reports, draft project report and final project report.

Electronic records

All data verified by the Monitoring Lead (field measurements) will be entered and stored in Excel spreadsheets. Key constituent data will be verified first by the Laboratory Director for Excelchem. After verification, key constituents data and laboratory QA will be forwarded electronically in PDF format to the Monitoring Lead. All key constituents data will be stored in Excel spreadsheets in order to more readily review the data. The Monitoring Lead will store the data reports on the Central Valley Water Board network drive, which is backed up nightly.

B1, Element 10. Sampling Process Design

The monitoring will be conducted once per site over a period of 2 non-consecutive days (June 25 for Sacramento River Basin and June 30 for San Joaquin River Basin) in order to demonstrate water quality during an irrigation period. Final design was reviewed by the CV-SALTS Technical Committee.

For all sites, safety and all-weather access are priorities for sampling activities. Based on field and weather conditions, the sampling plan may be modified by the project team during the sampling event to provide for field safety and make the collection accurate and thorough. Any changes will be documented on SWAMP field sheets.

Type and Total Number of Samples

All field parameters, bacteria, and chemical parameters will be monitored once at all 11 sites.

This study will analyze for all primary and secondary MCLs specified in Title 22, except for asbestos and radionuclides. In addition, *E. coli* and drinking water constituents of concern will be measured, and field measurements (DO, SC, pH, temperature, and turbidity) will be taken.

Travel blanks and field duplicates will be taken at a frequency of 5% of the total project sample count.

Table 6 Sample Dates and Sites Sampled

Location	Sites	Date Sampled
Sacramento River	**Colusa Basin Drain** above Knights Landing	June 25
	Sutter Bypass downstream of Obanion Outfall	
	Sacramento River at Rough and Ready Pumping Plant	
	Sacramento River below Verona	
San Joaquin River	**Salt Slough** at Lander Avenue	June 30
	Salt Slough at Sand Dam	
	Boundary Drain at SLCC Sampling Station	
	San Joaquin River at Crows Landing	
	Harding Drain	
	San Joaquin River at Airport Way near Vernalis	
	Del Puerto Creek at Vineyard Road	

Sampling Location

Sampling sites were selected based on accessibility, presence of water, agricultural area drained; And for the main stem rivers, sampling sites were selected based on proximity to agricultural drains. Consideration was also given to potential use of the resulting data by other programs and agencies.

GPS coordinates have been obtained from site reconnaissance done by Central Valley Water Board staff in June 2014.

A description of each sampling site is included in Appendix 1.

Inaccessible Sample Sites

If sampling locations become inaccessible, field crews will look for an alternate site within 100 yards of the original sampling site. If no alternative site can be located, no sample will be collected.

Project Activity Schedule

Sampling events will take place within the sample collection periods listed in the project schedule in A6 Element 6. Field parameters will be measured on site. Samples to be analyzed in labs will be transported to the respective labs at the end of the field run.

Bias – Sources and Minimization

Sample misrepresentation happens at the level of an individual sample or field measurement (e.g., collecting a water sample at a backwater pool that does not represent the bulk of the flow) and will be minimized by using SWAMP compliant training and sampling methods. Representativeness and bias are addressed in more detail in A7, Element 7.

B2, Element 11. Sampling Methods

Grab samples are to be collected at stream banks at the location of greatest flow (at least one inch below the surface) by direct submersion of the sample bottle. Stagnant water will not be sampled and photographs will be taken of the stagnant pool.

Samples will be collected using the Rinsing Technique and Sample Collection located in the Procedures Manual for Water Quality Monitoring (Appendix 6).

Rinsing Technique and Sample Collection:

When rinsing, rinse and discard sample water down-stream of where the sample is to be taken. Try not to disturb sediment or any other debris that could alter the sample. Avoid floating impurities, sediment disturbed by sampling, and organic material.

Stream Bank Grab Sample Collection

1. Remove lid.

2. Submerse bottle into sample water area filling about ¼ of the way.

3. Lift sample out of water and move away/downstream from sampling spot.

4. Agitate sample thoroughly, to rinse the inside of the container, and pour out.

5. Repeat Steps 2-4 two more times.

6. Collect the sample by submerging the bottle below the surface of the water and facing it up stream. Be sure to collect a full bottle and not disturb the bottom sediment.

7. Pour a small amount of the sample into the cap for rinsing, discard rinse water, and cap the sample.

The Rinsing Technique and Sample Collection method will be used to fill the 125 mL polyethylene bottles. The 125 mL bottles will be analyzed for MBAs, Total Dissolved Solids, Nitrate as Nitrogen, and Nitrite as Nitrogen.

The 250 mL polyethylene bottles contain nitric acid (HNO_3) and can't be rinsed. A separate 500 mL bottle will be filled using the Rinsing Technique and Sample Collection method. Once the 500 mL bottle is filled, it will then be transferred to the 250 mL bottle. The 250 mL bottles with nitric acid preservative will be analyzed for boron, total iron, sodium, total aluminum, total arsenic, and total manganese.

Three 40 mL VOA vials contain hydrochloric acid (HCL) and also can't be rinsed. The three VOA vials will be used to analyze the full list for volatile organic compounds. An additional VOA vial will be used to analyze Carbamate pesticides. A stainless steel cup attached to a metal pole to perform steps 2-6 of the Rinsing Technique and Sample Collection method. The stainless steel cup will then be used to transfer sample water into all four VOA vials until the surface tension builds a meniscus and then capped tightly to avoid bubbles.

Organochlorine pesticides, PCBs, Organophosphates, Chlorinated Herbicides, Semi-Volatile Organics, and Dioxin analysis will all need to be collected in amber glass containers. The amber glass containers will all contain preservatives, thus the amber glass containers will not be rinsed with sample water. A stainless steel cup attached to a metal pole to perform steps 2-6 of the Rinsing Technique and Sample Collection method. The stainless steel cup will then be used to transfer sample water into the appropriate amber glass container. Dioxin analysis will require two 1 Liter glass amber containers. Chlorinated herbicides, organophosphates, PCBs, Organochlorine pesticides, and semi-volatiles analysis each require 1 Liter glass amber containers

Field preparation

Field run preparation will consist of preparing field sheets (Appendix 8), bacteria processing sheet (Appendix 9), chain of custody forms (Appendix 10), sample labels, sample collection bottles, and verifying equipment functionality and availability.

Central Valley Water Board staff will be responsible for preparing all forms and obtaining sample bottles from Excelchem environmental labs.

On the day of the field run, prior to leaving the office, CVWB field personnel must sign out on the Ag and Surface Water Assessment Unit/Ag Regulatory Planning (ASWAU/ARP) sign out board located in the ASWAU/ARP section. Noting a mobile phone number and providing a map and anticipated schedule for sample collection.

Additionally, prior to leaving the office, CVWB samplers will need to complete the vehicle travel log and check the vehicle's tire pressure, oil, coolant, lights, etc. in order to avoid problems and/or delays while in the field. Report any major maintenance needed to the appropriate personnel and if needed retrieve an alternate truck.

Sample volume and bottle type

Specific conductivity, temperature, pH, and dissolved oxygen will be taken on site and do not require a sample volume or collection bottle.

Turbidity will be analyzed three times using the portable turbidimeter model 2100P from Hach. Sample water will be collected using a stainless steel cup on a metal pole using the Rinsing Technique and Sample Collection method. The sample water will then be transferred from the stainless steel cup to a 15 mL sample cell. The 15 mL sample cell will then be placed into the turbidimeter to analyze for turbidity.

Samples collected for boron, total iron, sodium, total aluminum, total arsenic, and total manganese will be collected in 250 mL plastic bottles that come from Excelchem environmental labs.

Samples collected for nitrate as nitrogen, nitrite as nitrogen, and MBAs will be collected in 125 mL plastic bottles that will come from Excelchem environmental labs.

Samples collected for the volatile organic compound scan and Carbamate pesticide scan will be collected in four 40 mL pre-acidified VOA vials that will be supplied by Excelchem environmental labs. There will be emphasis on no headspace on filling the VOA vials.

Sample preservation and holding times

Samples collected for volatile organic compounds will be collected using containers pre-preserved with hydrochloric acid from Excelchem environmental labs. Water samples analyzed for boron, sodium, iron, aluminum, arsenic, and manganese will be preserved by using Excelchem environmental labs sample bottles containing nitric acid.

All samples to be analyzed in the lab will be preserved on ice at <10°C and transported in coolers (darkness) to the analytical labs.

Sample equipment

All sample collection items are located in the Central Valley Water Board office. Most items are stored in areas specifically designated for the Ag Surface Water and Assessment Unit (ASWAU). The Calibration Room is a laboratory prep room located adjacent to the ASWAU lab, which is separate from the Central Valley Water Board's main lab. Sample collection equipment will consist of the following items:

Safety:

Equipment	Location
Roadside Emergency Kit	Garage ASWAU Locker
Toolbox	Garage ASWAU Locker
First Aid Kit	Garage ASWAU Locker
Jumper Cables	Garage ASWAU Locker
Rain Gear (as needed)	Garage ASWAU Locker
Floatation Vests (1 per sampler)	Garage ASWAU Locker

Field run requirements:

Equipment	Location
Ag/RB/SWAMP Field Books	Calibration Room
Clipboards w/field sheets	Calibration Room
pH/SC Kit (Includes Myron L)	Calibration Room
Bucket (w/ Rope and Insect Repellant)	Garage ASWAU Locker
Potable Water	Garage ASWAU Shelf
Map Books (North + South)	Calibration Room
Shovel	Garage ASWAU Locker
SC Box	Garage ASWAU Shelf
Polyethylene 5-gal Bucket	Garage ASWAU Shelf
Back-up Bottles	Garage ASWAU Shelf
Vehicle Travel Pouch	Admin office (Reserved vehicle)

Sample collection:

Equipment	Location
Camera (charge battery)	Calibration Room
Sample Poles	Garage ASWAU Locker
Sample Coolers (sample containers)	Calibration Room
Ice	Garage Ice Machine
YSI MDS + Sonde	Calibration Room

All field equipment should be checked prior to each field event to verify functionality. In addition, the following procedures apply to selected equipment:

Field monitoring books: The field monitoring books contain summarized monitoring information (e.g. site location maps, contact information, etc.), access keys and emergency information for field personnel and provide directions to and contact information for the analytical laboratories. Should there be any changes made to the monitoring schedules, the field monitoring books will be updated as well.

Field Sheets: Attach the field data sheet to the clipboard with a pencil, extra blank labels, and a photograph sheet of the monitoring sites.

Multipurpose meter/sonde: Retrieve the YSI multi-meter from the calibration room shelf. Record the identification number of the meter/sonde in the space provided on the field data sheet. Make sure the battery is fully charged and the DO membrane is good (i.e. with no bubbles) for the next day's use. Also include in the YSI bag a full service kit and a screwdriver. Included in the full service kit are:

- DO membranes
- Fine sanding disks
- O rings
- KCL Solution
- Grease
- Probe installation tool
- Tube brush
- Q tips
- Batteries

Tracking the YSI meters/sondes used in the field is important for proper maintenance. Calibration of the meter will be conducted the morning of sampling before leaving the office according to the instructions/cheat sheets (as detailed in the Procedures Manual for the San Joaquin River Water Quality Monitoring Program (Draft), July 2008) located in the calibration room cabinets. The YSI will also be checked or recalibrated at the end of the run and any time during the run if values seem not "normal." These results are then recorded on the field data sheet in the space provided (Appendix 8).

A Myron L SC/pH meter should be included as a back-up for the field runs and stored in the pH/SC kit. Calibration of the meter should be conducted prior to use as a back-up. Calibration instructions for the Myron are on the back of the meter

pH/SC kit: The pH/SC kit is an ice chest containing items used for QA/QC during field sampling runs. Reorganize this cooler and augment any supplies as needed. The supplies include:

- SC calibration solution (1417µmhos) (1000 ml bottle)
- pH calibration solutions (4, 7, and 10) (1000 ml bottles)
- DI water (1000 ml bottle)
- Tap water (1000 ml bottle)
- Disposable nitrile gloves (in all sizes)
- Waterproof marker, ball-point pen, pencil, safety glasses, paper towels
- Myron L SC/pH meter
- Liquid soap
- Alcohol spray bottle w/extra alcohol
- Stainless steel cup

Sampling poles: Sampling poles are used to retrieve a sample up to six feet from the bank. Extensions are available and should be used as necessary. Additionally, a stainless steel cup attached to a pole by a clamp attachment will be used to collect volatile organic compound samples.

Bucket and rope: A stainless steel bucket (triple rinse) and rope can be used for sampling off a bridge when there is no safe access to the bank or the distance is too great for the extensions. Additionally, the bucket can be used to carry sampling bottles to and from the site.

Cellular telephone: The field crew must have one cellular phone with them in case for emergencies.

Life vests: **Even the best swimmers can succumb to hypothermia.** The ASWAU/ARP has three life vests and additional life vests are available in the office. Life vests should be worn when sampling from bridges, boats, unstable banks, or during periods of extremely high flow.

Toolbox (blue) and road emergency box (red): Periodically inspect the toolbox and road emergency box to ensure that the appropriate contents are present and in working order. Contents are listed below:

Tool Box	**Road Emergency Box**
Screwdriver, pliers	Flares
Flashlight	Reflector triangles
Graduated cylinder	Fire extinguisher
Duct tape	First aid kit
Utility knife	
Chain w/ locks	
W-D 40	
Sigma tubing	
Toilet paper	
Spare field keys	
Spare C Batteries w/ YSI Cover	
Utility Saw	
Desiccant	

Shovel/spades: Carry a shovel or spade in the truck in case the truck gets stuck and must be dug out.

Boots: Each sampler is responsible for being fit for their own rubber boots. If no boots fit the sampler, it will be necessary to have boots ordered. Hip waders can also be ordered as needed.

Ice: Prepare bags of ice the day prior to sampling and leave these bags inside the ice machine to be pulled by the sampling crew.

Water and food: Drinking water is necessary to maintain normal bodily functions. Bring plenty of water for a day. During the summer, double the amount of water you bring to avoid dehydration. While in the field, convenience food stores are not always available, therefore, pack a lunch and some snacks for the day. **Wash your hands prior to eating as we are sampling waterways that may contain unknown contaminants.** There are extra water coolers available to carry water for washing hands.

Personal protective gear: It is the responsibility of each sampler to think ahead and watch the weather forecast in order to dress appropriately for field monitoring. Rain gear is available in the ASWAU/ARP locker located in the garage area. Items that you may want to consider bringing from home are:

- Hiking boots
- Heavy coat/sweater/sweatshirt
- Hat
- Warm gloves
- Sunglasses
- Sunscreen

Other personal items: All field personnel will need a CRWQCB identification card that can be obtained from Scott Mills, 916-464-4688. Carry this card in case you are asked to identify yourself by other agencies or the local growers. Money is also helpful for those unexpected necessities.

Double Check: After coolers with samples are placed out in the garage with the appropriate equipment, check all equipment off the checklist. The checklist is located in the garage on the ASWAU shelf.

Sample collection procedures

Sample collection procedures are summarized in Appendix 6.

Responsible person

The Monitoring Lead is ultimately responsible for coordinating field activities. However, staff may be delegated responsibilities for conducting the work to ensure all activities are completed. For instance, Central Valley Water Board staff and/or students may be tasked to prepare field sheets, label sample bottles, and conduct sample collection on field runs.

Any issues that cannot be readily corrected should be brought to the attention of the Monitoring Lead and noted on the field sheet. The Monitoring Lead will be responsible for investigating and resolving the issue.

B3, Element 12. Sample Handling and Custody

Maximum holding times

Field parameters do not have a holding time since the results will be determined on site. For all key constituent samples, the samples will be immediately placed on ice in a cooler for transport to the laboratories. Sacramento River samples that will be taken on June 25, 2014 will be delivered to Excelchem at the end of the field run. San Joaquin River samples that will be taken on June 30, 2014 will be picked up by Excelchem.

Maximum holding time stated in the Surface Water Ambient Monitoring Program Quality Assurance Program Plan (QAPrP) is 6 months after preservation for boron, iron, sodium, aluminum, arsenic, and manganese. The maximum hold time for volatile organic compounds scan is 14 days. Nitrate as Nitrogen, Nitrite as Nitrogen, and MBAs have a maximum hold time of 48 hours. The data generated from the samples collected are intended to characterize agriculturally dominated water bodies and assist in evaluating the appropriateness of the MUN beneficial use in agricultural drains.

Sample Handling

Identification information for each sample will be recorded on the label on the plastic sample bottles when the sample is collected. The same identification information on the bottles utilized for collecting the sample will also be on the field sheet and chain of custody (COC) forms.

Transport

Samples will be stored in coolers with ice, at a temperature of <10°C.

Samples to be analyzed for key constituents will be delivered to:

Excelchem Environmental Labs
1135 W. Sunset Blvd, Suite A
Rocklin, CA 95765
Tel: 916-543-4445

Maps to the appropriate laboratories are located within the field monitoring books.

Sample Transfer

Field crews will deliver June 25th samples and Chain of Custody (COC) forms to Excelchem staff designated to receive samples. Excelchem staff will pick up June 30th samples and COC forms. Samples collected will be verified against field sheets and chain of custody forms. Discrepancies and any additional notes, such as holding time exceedances, incorrect sample identification information, inappropriate sample handing, or missing/inadequate field equipment calibration information, will be noted on the field sheets and chain of custody forms, as needed by the staff receiving the samples.

Sample Handling and Custody Documentation

All samples will be handled so as to minimize contamination. Sample containers will be clearly labeled. All caps and lids will be checked for tightness prior to transport. Samples will be placed in the ice chests with enough ice, or other packing, to include empty sample collection bottles, to completely fill the ice chest. Chain of custody forms will be placed in an envelope and taped to the top of the ice chest or they may be placed in a plastic bag and taped to the inside of the ice chest lid. Samples will be handled using aseptic technique so as to minimize chance for contamination.

Responsible Individuals

The Monitoring Lead and Lab Director will have ultimate responsibility for ensuring samples are properly handled and transferred. However, it is also the responsibility of the persons collecting, relinquishing, and receiving samples to initially verify correct sample handling and transfer.

Sample Identification

Appendix 4 details the sample ID conventions, information that will be included on each bottle, and how samples will be labeled.

Chain of Custody Procedures

Field measurements do not require specific custody procedures since they will be conducted on site at the sample collection location.

Copies of chain of custody forms and all field sheets will be kept in a MUN project binder in the Monitoring Lead’s office.

B4, Element 13. Analytical Methods and Field Measurements

Field analytical procedures

Table 7 Field and Laboratory Analytical Methods

Analyte	Project Action Limit (units, wet or dry weight)	Project Reporting Limit (units, wet or dry weight)	Analytical Method		Achievable Laboratory Limits	
			Analytical Method/ SOP	Modified for Method yes/no	MDLs (1)	Method (1)
Central Valley Regional Board						
DO	NA	NA	360.1	No	NA	NA
SC	NA	NA	b/120.1	No	NA	NA
pH	NA	NA	a/150.1	No	NA	NA
Temp	NA	NA	Temperature	No	NA	NA
Turbidity	NA	NA	*SM 2130B / EPA 180.1	No	NA	NA
ExcelChem Environmental Labs						
Aluminum	NA	50.0 µg/L	ICP or MS	No	24.5 µg/L	EPA 200.7
Ammonia as Nitrogen	NA	0.100 mg/L	Ion Chromatography	No	0.0400 mg/L	SM 4500-NH3 B/H
Antimony	NA	10 µg/L	ICP or MS	No	1.3 µg/L	EPA 200.7
Arsenic	NA	10.0 µg/L	ICP or MS	No	1.0 µg/L	EPA 200.7
Barium	NA	5.0 µg/L	ICP or MS	No	1.2 µg/L	EPA 200.7
Beryllium	NA	5.0 µg/L	ICP or MS	No	0.09 µg/L	EPA 200.7
Boron	NA	50.0 µg/L	ICP or MS	No	0.8 µg/L	EPA 200.7
Bromodichloromethane	NA	0.5 µg/L	GC/MS	No	0.05 µg/L	EPA 8260B
Bromoform	NA	0.5 µg/L	GC/MS	No	0.03 µg/L	EPA 8260B
Cadmium	NA	5.0 µg/L	ICP or MS	No	0.1 µg/L	EPA 200.7

Analyte	Project Action Limit (units, wet or dry weight)	Project Reporting Limit (units, wet or dry weight)	Analytical Method		Achievable Laboratory Limits	
			Analytical Method/ SOP	Modified for Method yes/no	MDLs (1)	Method (1)
Chloride	NA	0.5 mg/L	Ion Chromatography	No	0.04 mg/L	EPA 300
Chlorinated Herbicide (DCPA)	NA	0.400 µg/L	GC	No	0.0150 µg/L	EPA 8151A
Chloroform	NA	0.5 µg/L	GC/MS	No	0.05µg/L	EPA 8260B
Chromium	NA	5.0 µg/L	ICP or MS	No	0.3 µg/L	EPA 200.7
Copper	NA	5.0 µg/L	ICP or MS	No	0.8 µg/L	EPA 200.7
Dibromochloromethane	NA	0.5 µg/L	GC/MS	No	0.07 µg/L	EPA 8260B
Dioxin/Furan	NA	10-100 pg/L	HRMS	No	1.97-14.2 pg/L	1613B
Fluoride	NA	0.1 mg/L	Ion Chromatography	No	0.02 mg/L	EPA 300
Hardness	NA	5.00 mg/L	ICP or MS	No	2.86 mg/L	SM2340B
Iron	NA	20.0 µg/L	ICP or MS	No	11.5 µg/L	EPA 200.7
Lead	NA	5.0 µg/L	ICP or MS	No	0.9 µg/L	EPA 200.7
Manganese	NA	10.0 µg/L	ICP or MS	No	0.6 µg/L	EPA 200.7
MBAs	NA	0.100 mg/L	Wet Chemistry	No	0.0600 mg/L	SM5540C
Nickel	NA	5.0 µg/L	ICP or MS	No	0.6 µg/L	EPA 200.7
Nitrate as Nitrogen	NA	0.11 mg/L	Ion Chromatography	No	0.009 mg/L	EPA 300.0
Nitrite as Nitrogen	NA	0.15 mg/L	Ion Chromatography	No	0.03 mg/L	EPA 300.0

Analyte	Project Action Limit (units, wet or dry weight)	Project Reporting Limit (units, wet or dry weight)	Analytical Method		Achievable Laboratory Limits	
			Analytical Method/ SOP	Modified for Method yes/no	MDLs (1)	Method (1)
Organo-chlorine Pesticides	NA	0.100 µg/L	GC/ECD	No	0.005-0.021 µg/L	EPA 8081A
Organo-phosphorus Pesticide	NA	0.200-0.250 µg/L	GC	No	0.0270-0.169 µg/L	EPA 8141A
PCB’s	NA	1.00 µg/L	GC	No	0.0600-0.130 µg/L	EPA 8082
Selenium	NA	20 µg/L	ICP or MS	No	1.3 µg/L	EPA 200.7
Semi-volatiles	NA	2.00-30.0 µg/L	GC/MS	No	0.1-2.2 µg/L	EPA 8270C
Silver	NA	5.0 µg/L	ICP or MS	No	0.4 µg/L	EPA 200.7
Sodium	NA	200 µg/L	ICP or MS	No	120 µg/L	EPA 200.7
Sulfate	NA	0.5 mg/L	Ion Chromatography	No	0.07 mg/L	EPA 300
Thallium	NA	20.0 µg/L	ICP or MS	No	2.2 µg/L	EPA 200.7
Total Dissolved Solids	NA	15.0 mg/L	Dried at 180°C	No	7.68 mg/L	SM 2540C
Zinc	NA	10 µg/L	ICP or MS	No	0.3 µg/L	EPA 200.7

(*) Standard Methods for the Examination of Water and Wastewater, 20th edition.

Instruments to be used in Field

Field measurements for DO, EC, pH, and temperature will be collected using the YSI EXO 1 Sonde. A probe guard will be attached at the end of the YSI to avoid fouling and protect the probes. If using the probe guard is not sufficient, the YSI may be hung by the bail from a sampling pole while the probe readings stabilize and are recorded.

Turbidity measurements will be collected using the Hach 2100P turbidimeter. Samples will be collected by using a stainless steel cup that is attached to a sampling pole and then poured into the glass vial. Care will be taken to minimize disturbance of the bottom of the stream bed. Should sediment be disturbed as a result of sample collection activities, the sampler will wait for the sediment to wash downstream before collecting the sample.

Equipment to be used for laboratory analysis

Equipment to be used for analysis of total metals and minerals:

- Inductively Coupled Plasma (ICP)/Mass Spectrophotometer (MS)
- Laboratory ware
- Air displacement pipets
- Analytical balance
- Sample preparation apparatus
- Clean hood

Equipment to be used for analysis of poly-chlorinated-dibenzo-p-Dioxin/Furan (HRMS):

- High Resolution Gas Chromatograph/High-Resolution Mass Spectrometer/Data System (HRMS)
  - GC Injection Port
  - Gas Chromatography/Mass Spectrometer
  - Mass Spectrometer
- Data System
- GC Columns

Equipment to be used for analysis of Carbamate Pesticides:

- High Performance Liquid Chromatography (HPLC)
- HPLC system
- C-18 reverse phase HPLC column
- Post Column Reactor with two solvent delivery systems
- Fluorescence detector

Equipment to be used for analysis of volatile organic compounds, pesticides, herbicides:

- Purge and trap system
  - Purging device
  - Trap

Gas chromatograph (GC)
Capillary GC columns
Column 1, 2, 3, 4
Mass spectrometer
Purge and trap – GC/MS interface
Data system
Syringes
Syringe valves
Microsyringes
Bottles

Equipment to be used for analysis of MBAs (Foaming Agents):
Colorimetric equipment
Spectrophotometer
Filter photometer
Separatory funnels

Equipment to be used for analysis of Nitrate and Nitrite as Nitrogen:
Spectrophotometer
Filter photometer (Nitrite as N analysis only)

Method Performance Criteria

Unless otherwise noted, SWAMP reporting limits do not exist for constituents to be monitored in this study.

YSI EXO 1 300/301 Probes
(http://www.ysi.com/productsdetail.php?EXO1-Water-Quality-Sonde-89)
Temperature

Sensor Type	Thermistor
Range	-5 to 50°C
Accuracy	±0.01 °C (-5-35°C)
	±0.05 °C (35-50°C)
Resolution	0.001°C
Depth	200 meters

Rapid Pulse Dissolved Oxygen, % saturation, mg/L (Calculated from %air saturation, temperature and salinity)

Sensor Type	Optical, luminescence lifetime
Range	0 to 50 mg/L
	0 to 500% air sat.
Accuracy	±1% of the reading or 0.1 mg/L, whichever is greater (0-20 mg/L)
	±5% of reading (20-50 mg/L)
	±1% reading or 1% air sat., whichever is greater (0-200%)
	±5% reading (200-500%)
Resolution	0.01mg/L
	0.1% air sat.
Depth	200 meters

pH

Sensor Type	Glass combination electrode
Range	0 to 14 units
Accuracy	±0.1 units within 10°C of calibration temperature
	±0.2 pH units for entire temp range
Resolution	0.01 units
Temperature range	-5 to 50°C
Depth	200 meters

Conductivity

Sensor Type	4 electrode nickel cell
Range	0 to 200 mS/cm
SWAMP RL	2.5mS/cm
Accuracy	±0.5% of reading +0.001 mS/cm, whichever is greater (0-100 mS/cm)
	±1% of reading (100-200 mS/cm)
Resolution	0.0001 mS/cm to 0.01 mS/cm (range-dependent)
Temperature Range	-5 to 50°C
Depth	200 meters

Hach 2100P Turbidimeter
(http://www.hach.com/fmmimghach?/CODE%3AL1619_09-0713836%7C1)

Method	EPA Method 180.1 (Nephelometric Ratio)
Range	0 to 1000 NTU

SWAMP RL	0.5 NTU
Accuracy	±2% of reading plus stray light
Precision	±1% of reading, or 0.01 NTU, whichever is greater
Resolution	0.01 on lowest range
Temperature Range	0 to 50°C
Depth	200 meters
Sample Required	15 mL
Sample Cells	60X25 mm borosilicate glass with screw caps

Corrective Actions

When failures in the laboratory occur, the Monitoring Lead and Lab Director will each be responsible for corrections in their respective laboratories. All failures will be documented on the field sheet and with the data report, along with the corrective action that was made. Additionally, corrections will be annotated in any applicable maintenance logs.

Sample Disposal Procedures

All samples collected will be transferred to Excelchem Environmental. The laboratory will properly dispose of water samples after three months upon receipt of samples.

Laboratory Turnaround Times

Samples analyzed for key constituents will have results 2 weeks from the time Excelchem Environmental Labs received the samples.

B5, Element 14. Quality Control

This section describes the field quality control samples to be used in this study.

Quality Control Activities

The following checks will be utilized to ensure quality control:

Table 8 Quality Control Checks

QC Check	Information Provided
BLANKS	
Travel blank	Transport bias
Laboratory blank	Assessment of background level of target analyte resulting from sample preparation and analysis
CALIBRATION CHECK SAMPLES	
Zero check	Calibration drift and memory effect
Span check	Calibration drift and memory effect
Mid-range check	Calibration drift and memory effect
REPLICATES	
Field replicates	Precision of all steps after acquisition
Laboratory replicates	Analytical precision

Quality Control Samples

Laboratory quality control samples (laboratory blank, laboratory control spike, laboratory control spike duplicate, matrix spike, matrix spike duplicate, laboratory duplicate, and surrogates) will be created by Excelchem Environmental to be analyzed with field samples. Specific field quality control sample types are described below.

Laboratory Blank

Laboratory blanks (also known as method blanks) provide bias information on possible contaminants for the entire laboratory analytical system. These samples will be made from sterile purified water that is known to have no detectable levels of the target analytes. Laboratory blanks will be analyzed along with the project samples to document background contamination of the analytical measurement system. The lab results must be less than the Reporting Limit of the target analytes to be acceptable.

Matrix Spike and Matrix Spike Duplicate

Matrix spikes and matrix spike duplicates measure precision and accuracy by determining if the methodology is in control for the particular matrix being analyzed. Matrix spikes are client samples to which a known amount of analyte has been added prior to sample extraction/digestion and instrumental analysis. The lab results must have percent recoveries between 80-120% and the matrix spike duplicate must have a relative percent difference below 25% to be considered acceptable.

Laboratory Control Spike and Laboratory Control Spike Duplicate

Laboratory control spike and laboratory control spike duplicates measure accuracy by determining if the methodology has been performed to meet criteria established by regulation, method or laboratory control chart data. Laboratory control spikes (LCS) and LCS duplicates are generated by spiking the analyte into a relatively inert matrix. The lab results must have percent recoveries between 80-120% and the LCS duplicate must have a relative percent difference below 25% to be considered acceptable.

Surrogates

Surrogates are utilized in organic analytical methods in order to measure precision. Surrogates are organic compounds which behave similarly to the analytes of interest, but are not normally found in environmental samples. Lab results must have percent recoveries between 70-130%

Calibration Check Samples

Field measurement equipment will be checked for calibration against standards of known concentrations for pH and SC. Checks will be run at the beginning of the field run, after ten samples, and/or at the end of the field run.

Travel Blank

Travel blanks help isolate contamination associated with sample transport. Travel blanks are not opened during the sample collection. These blanks are created by using deionized water from the Central Valley Water Board Lab to fill sample containers. Travel blanks will be preserved, packaged, and sealed exactly like the surface water samples and will be submitted blind to the lab. The lab results must be less than the reporting limit of the target analytes to be acceptable.

Field Duplicates

Field duplicates shall be collected immediately following the collection of normal samples. In cases where multiple intermediate bottles are used for a single analysis, field duplicates and normal sample containers should be filled in an alternating sequence (i.e., normal-duplicate-normal-duplicate). Field duplicates should be submitted “blind” to the laboratories. Five percent of total project sample count will be managed for field duplicates.

Laboratory Duplicates

Laboratory duplicates provide precision information on the analytical methods with the target analytes. The laboratory will generate the duplicate samples by splitting one sample for duplicate analysis. Lab results must have a relative percent difference (RPD) less than 25.

Quality Assurance Frequency of Analysis and Measurement Quality Objectives

Quality control checks above will be conducted at the frequencies described below. Evaluation will be based on the measurement quality objectives listed in Table 9:

Table 9 Quality Assurance Frequency of Analysis and Measurement Quality Objectives

LABORATORY QUALITY CONTROL	FREQUENCY OF ANALYSIS	MEASUREMENT QUALITY OBJECTIVE
Matrix Spike and Matrix Spike Duplicate	10% of samples	75-125% Recovery RPD < 25
Laboratory Control Spike and Laboratory Control Spike Duplicate	10% of samples	75-125% Recovery RPD < 25
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Laboratory Duplicate	Per 10 samples	RPD < 25%
Surrogates (VOC analysis)	All samples and Lab QA	70-130% Recovery
FIELD QUALITY CONTROL	FREQUENCY OF ANALYSIS	MEASUREMENT QUALITY OBJECTIVE
Field Duplicate	5% of total project sample count	RPD < 25%
Travel Blank	Per method	Blanks <RL for target analyte

Corrective Actions

The Contract Manager/QA officer is ultimately responsible for ensuring samples meet QA requirements and that appropriate corrective actions are followed. However, this does not exclude the Excelchem Environmental Labs Lab Director and QA Officer from maintaining responsibility for following QA/QC procedures for analyses conducted by Excelchem personnel.

The following table identifies QC samples and the corresponding corrective actions to be taken should problems arise.

Table 10 Corrective Actions

Laboratory Quality Control	Corrective Action
Matrix Spike and Matrix Spike Duplicate	If it is determined that there is a matrix effect, analyses may be resumed. Otherwise, analyses are suspended while the issue is resolved.
Laboratory Control Spike and LCS Duplicate	If LCS or LCS Duplicate fails, the data can be reported with a qualifier. If acceptable recoveries are not obtained, further analyses are halted until a cause can be identified and corrective action taken.
Surrogate Spikes	Analyses are suspended while the issue is resolved.
Laboratory Blank	The source of the contamination will be investigated and corrected, if possible. Flag associated samples as determined by the Monitoring Lead.
Laboratory Duplicate	Investigate possibility of analyst error.
Field Quality Control (Bacteria)	Corrective Action
Field Duplicate	Investigate possibility of analyst error.
Travel Blank	If contamination of the travel blanks and associated samples is known or suspected, the laboratory should qualify the affected data, and notify the Project Lead and/or Monitoring Lead, who in turn will follow the process detailed in the method.
Field Quality Control (Field measurements)	Corrective Action
DO, SC, pH, Temperature, Turbidity	The instrument should be recalibrated following its manufacturer's cleaning and maintenance procedures. If measurements continue to fail measurement quality objectives, affected data should not be reported and the instrument should be returned to the manufacturer for maintenance. All troubleshooting and corrective actions should be recorded on the Central Valley Water Board field sheet (Appendix 7)

B6, Element 15. Instrument/Equipment Testing, Inspection, and Maintenance

Periodic Maintenance

Field measurement equipment will be checked in accordance with the manufacturer's specifications. This includes battery checks and cleaning. All equipment will be inspected when first handed out and when returned from use for damage. Equipment will be maintained in accordance with its SOPs, which include those specified by the manufacturer and those specified by the method used in this study.

Field equipment inspection is carried out prior to each trip in the field. Testing is not conducted if equipment appears visibly worn or if field technicians report problems with the equipment upon returning from the field.

Laboratory instruments at Excelchem are calibrated at specified frequency and within acceptance limits published by EPA. In cases in which specific guidelines are not available, Excelchem applies either the manufacturer's recommended guidelines or in-house guidelines.

Testing Criteria

See Table 11 Testing, Inspection, and Maintenance of Sampling Equipment and Analytical Instruments. See Appendix 11 for equipment testing at Excelchem.

Persons Responsible for Testing, Inspection and Maintenance

The Monitoring Lead is responsible for ensuring equipment relevant to their team is properly tested, inspected and maintained. Staff may be delegated the responsibility of carrying out these tasks.

Spare Parts

Location of spare parts for each piece of equipment is listed in Table 11 Testing, Inspection, and Maintenance of Sampling Equipment and Analytical Instruments. See Appendix11 for equipment testing at Excelchem.

Deficiencies

If deficiencies are found, the necessary maintenance will be performed and then the equipment will be recalibrated and re-inspected. A pre- and post-calibration will be run to determine if the problem has been fixed. If this does not correct the problem, then the equipment will be taken out of use and sent to the manufacturer for servicing. Deficiencies that cannot be immediately corrected will be annotated on the field sheets, as applicable, and noted in the maintenance/calibration logs.

Table 11 Testing, Inspection, Maintenance of Sampling Equipment

Group	Equipment / Instrument	Maintenance Activity, Testing Activity or Inspection Activity	Responsible Person	Testing/ Inspection Frequency	Location of Spare Parts	SOP Reference
Central Valley Water Board	pH probe (YSI)	Calibration Check	Monitoring Lead	Per field run	Calibration Room	YSI User's Manual
	DO probe (YSI)	Calibration Check	Monitoring Lead	Per field run	Calibration Room	YSI User's Manual
	EC probe (YSI)	Calibration Check	Monitoring Lead	Per field run	Calibration Room	YSI User's Manual
	Temperature probe (YSI)	Inspection	Monitoring Lead	Per field run	Calibration Room	YSI User's Manual
	Hach 2100P turbidimeter	Calibration Check	Monitoring Lead	Per field run	Calibration Room	Hach User's Manual
	Incubator	Temperature check	Contract Manager	Per field run	Order as needed	Fisher Scientific, Binder User's Manuals
	UV Lamp	Inspection	Contract Manager	Per field run	Spare UV Lamp located in main Central Valley Water Board lab	Central Valley Water Board Bacteria Monitoring Procedures
	Sealer	Cleaning, Inspection	Contract Manager	Monthly	Order as needed	Idexx Sealer Manual

B7, Element 16. Instrument/Equipment Calibration and Frequency

All equipment and instruments are operated and calibrated according to the manufacturer's recommendations. Operation and calibration are performed by personnel properly trained in these procedures. Documentation of all calibration information is recorded in the appropriate logs. If equipment is not meeting the listed criteria (Table 11) it is the responsibility of the field crews to notify the Monitoring Lead and Project Lead, who will be responsible for addressing the problem. Correction may include repair or replacement of equipment. All corrective actions are documented in the appropriate log.

B8, Element 17. Inspection/Acceptance of Supplies and Consumables

Upon receipt and prior to use, all calibration standards will be inspected by the field staff for broken seals and to compare the age of each reagent to the manufacturer's designated shelf life.

The Monitoring Lead and Project Lead are each responsible for inspection and acceptance of supplies and consumables used by their respective portions of this study.

Details for each consumable are included in Table 12.

Table 12 Inspection/Acceptance Testing Requirements for Consumables and Supplies

Project-Related Supplies / Consumables*	Inspection / Testing Specifications	Acceptance Criteria	Frequency	Responsible Individual
pH 7 Calibration Solution	Used to calibrate pH probe on YSI	Bottle tightly closed	Upon arrival and prior to use	Monitoring Lead
pH 4 Calibration Solution	Used to calibrate pH probe on YSI	Bottle tightly closed	Upon arrival and prior to use	Monitoring Lead
pH 10 Calibration Solution	Used to calibrate pH probe on YSI	Bottle tightly closed	Upon arrival and prior to use	Monitoring Lead
1417 Calibration Solution	Lowest solution used to calibrate conductivity probe on YSI	Bottle tightly closed	Upon arrival and prior to use	Monitoring Lead

B9, Element 18. Non-Direct Measurements (Existing Data)

Existing Data

Data Quality Indicators (DQIs) will be used to judge whether the external data meets acceptance criteria. These include, for example, precision, accuracy, representativeness, comparability, completeness, bias, and sensitivity.

Measurement performance information such as method detection limits (MDLs), method quantification levels, and the selectivity of a method (or lack of sensitivity) for the target analytes will be used to judge whether the external data meets acceptance criteria.

Acceptance of external data for use will depend on the relevance of the matrix, location of the samples, and the methods that were used for collection and/or analysis (for example, field versus laboratory-based methods, the method of collection and analysis, etc.).

Water chemistry and field measurement data collected through this project will be stored in Excel spreadsheets until more resources become available. Additionally, data collection stations for parameters such as flow and precipitation can be accessed through the California Data Exchange Center (http://cdec.water.ca.gov). Where appropriate, this data may be assessed in this study in order to better characterize long term trends.

Usage Limits

If and when external data does not meet acceptance criteria, it will, at the very least, be flagged as such. Flagged data may possibly be used under certain conditions, but its use will be limited and clearly designated.

B10, Element 19. Data Management

Data will be maintained as established in Element 9 above. All data from this study will be stored in Excel files until resources are available to transfer the information to a statewide data base.

The Monitoring Lead maintains overall responsibility for proper data handling. Specific tasks may be delegated to other participants in this study. The Monitoring Lead will keep hard copies of monitoring related project documents in a dedicated binder. Monitoring related documents include: the Monitoring Plan (MP), the Quality Assurance Project Plan (QAPP), field logs, field data forms, COC forms and laboratory reports.

<u>Data/information Handling and Storage</u>

Recording, transcribing, digitizing, and downloading data:
Central Valley Water Board staff will prepare field sheets (Appendices 6 and 7) prior to the field run to include sample run and sample location identification information. The sheets will be printed on waterproof paper.

Field crews will record observations and field measurement data at the sampling locations, using pencil. Prior to leaving the field site, field data sheets will be checked for completeness and accuracy.

Transmittal
See A9, Element 9

Management
See A9, Element 9

Storage
See A9, Element 9.

Retrieval:
The main contact for records will be through the Monitoring Lead, who will maintain the official project file. Contact information can be found in Table 2, A4, Element 4.

<u>Computerized Information System Maintenance</u>

Official electronic files will be maintained by the Monitoring Lead once the data reports are received. The file will be located on the Central Valley Water Board network at R:\RB5\R5SSections\Irrigated Lands Assessment Planning\aCross Section\Ag Dominated WBs\MUN POTWs\Title22Monitoring\Lab Results.

The Central Valley Water Board Information Technology unit performs backup nightly on all network drives.

SWAMP Information Management System

Field measurement and key constituents data will be verified as meeting QA/QC requirements by the Monitoring Lead. Once the data is verified acceptable, it will be entered into Excel spreadsheets by the Monitoring Lead.

C1, Element 20. Assessments and Response Actions

Assessment and oversight involves field activities to ensure that the QA Project Plan is being implemented as planned and that the project activities are on track. By implementing proper assessment and oversight, finding critical problems toward the end of the project is minimized, when it may be too late to apply corrections to remedy them.

Two types of assessments may be used in this project: field assessments and laboratory assessments.

Field assessments will include:

- Readiness reviews to verify field teams are properly prepared prior to starting field activities;
- Field activity audits to assess field team activities during their execution; and
- Post sampling event reviews to assess field sampling and measurement activities methodologies and documentation at the end of all events or a selected event.

Laboratory assessments may involve two types of activities:

- Data reviews of each data package submitted by a laboratory; and
- Audits of laboratory practices and methodologies.
    - Field duplicates and travel blanks will be submitted blind to the laboratories to assess precision and contamination.

Project assessments

Readiness reviews will be conducted by the Monitoring Lead prior to each sampling run. All sampling personnel will be given a brief review of the sampling procedures, the equipment that will be used during sampling, and the goals and objectives of the sampling event. Readiness reviews will consist of the following activities:

- Equipment checks – It is important that all field equipment be clean and ready to use when it is needed. Therefore, prior to using all sampling and/or field measurement equipment, each piece of equipment will be checked to make sure that it is in proper working order.
- Equipment maintenance records – Equipment maintenance records will be checked to ensure that all field instruments have been properly maintained and that they are ready for use.
- Supply checks – Adequate supplies of all items in B2, Element 11 will be checked before each field event to make sure that there are sufficient supplies to successfully support

each sampling event.

- Paperwork checks – It is important to make sure that all field activities and measurements are properly recorded in the field. Therefore, prior to starting each field event, necessary paperwork such as field sheets, chain of custody record forms, etc. will be checked to ensure that sufficient amounts are available during the field event.

Field activity audits are held per the Central Valley Water Board's Procedures Manual to assess the sample collection methodologies, field measurement procedures, and record keeping of the field crew in order to ensure that the activities are being conducted as planned and as documented in this QAPP.

Post sampling event reviews will be conducted by the Monitoring Lead following each sampling event in order to ensure that all information is complete and any deviations from planned methodologies are documented. Activities include reviewing field measurement documentation in order to help ensure that all information is complete.

Laboratory data review will be conducted by Excelchem's QA Officer upon receipt of data from each lab. Data will be checked for completeness, accuracy, specified methods were used, and that all related QC data was provided with the sample analytical results.

Laboratory audits will include blind sample submission to the labs by the monitoring lead for each sampling run. The results of the lab's analysis will be compared to the known analytes (e.g. lab blanks) or acceptable ranges (e.g. lab duplicates)

Assessment reports

Separate assessment reports will not be generated for readiness reviews, field activity audits, or post sampling event reviews. Instead, problem areas such as sample collection or transport of samples will be notated on field sheets. The monitoring lead will be responsible for correcting or minimizing the problem for the next sampling event after reviewing the notes on the field sheets.

Laboratory assessment information (data review and audit) will be included in the laboratory data sets.

Corrective action

If a problem arises, prompt action to correct the immediate problem and identify its root causes is imperative. Any related systematic problems must also be identified.

Problems regarding field data quality that may require corrective action will be documented in the field data sheets. Deficiencies that cannot be immediately corrected will be noted on the Central Valley Water Board field sheet and brought to the attention of the Monitoring Lead. The Monitoring Lead will coordinate with the Central Valley Water Board staff to correct the deficiencies. The results of the resolution of the discrepancy will be documented in writing on the field sheet and on a separate log that will be kept in the project file.

Individual laboratory data quality will be reviewed by the Monitoring Lead. Deficiencies and corrective actions taken will be noted on the Excelchem report and on the Excel spreadsheets to which the data will be transferred. Overall laboratory data quality will be reviewed by the Monitoring Lead.

The Monitoring Lead and Project Lead have the authority to issue stop work orders to stop all sampling and analysis activities until the discrepancy can be resolved.

C2, Element 21. Reports to Management

Interim and final reports

The Excelchem Lab Director will review draft reports to ensure the accuracy of data analysis and data interpretation.

Table 13 QA Management Reports

Type of Report	Frequency	Projected Delivery Dates(s)	Person(s) Responsible for Report Preparation	Report Recipients
Data report	Per field run	7 days after receipt of samples	Excelchem Lab Director	Monitoring Lead

Quality Assurance Reports

Separate quality assurance reports will not be generated. Quality assurance information annotated on field and lab sheets will be included with the Data reports.

D1, Element 22. Data Review, Verification, and Validation Requirements

Data review, verification, and validation procedures help to ensure that project data will be reviewed in an objective and consistent manner. Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly.

Responsibility for Data Review

The Monitoring Lead will be responsible for data review. This includes checking that all technical criteria have been met, documenting any problems that are observed and, if possible, ensuring that deficiencies noted in the data are corrected.

Checking for Common Errors

Data produced from the project will be examined in-house to check for common types of data errors. This will include reviewing the data for errors pertaining to entry, transcription, transformation, and calculation.

Checking Against MQOs

Data generated by project activities will be reviewed against method quality objectives (MQOs). This will ensure that the data is of acceptable quality and it is be SWAMP-comparable with respect to minimum expected MQOs.

Checking Against QA/QC

QA/QC requirements were developed and documented in B3, Element 12; B4, Element 13; B5, Element 14; B7, Element 16; and B8, Element 17 and the data will be checked against this information. Checks will include evaluation of field and laboratory duplicate results; and field and laboratory blank data pertinent to each method and analytical data set. This will ensure that the data will be SWAMP-comparable with respect to quality assurance and quality control procedures.

Checking Lab Data

Lab data consists of all information obtained during sample analysis. Initial review of laboratory data will be performed by the laboratory QA/QC Officer in accordance with the lab's internal data review procedures. However, once the Central Valley Water Board receives the lab data, independent checks will be performed to ensure that the data is complete, consistent, and meets management requirements of the data management section of this QAPP.

Data Verification

Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications.

Data Validation

Data validation is an analyte- and sample-specific process that evaluates the information after the verification process (i.e., determination of method, procedural, or contractual compliance) to determine analytical quality and any limitations. The Central Valley Water Board will conduct data validation in order to ensure that the data is able to be used in evaluating the MUN beneficial use.

Responsibility for Data Validation

The Monitoring Lead will be responsible for validation of data.

Data Separation

Data will be separated into three categories for use with making decisions based upon it. These categories are:

1. Data that meets all acceptance requirements
2. Data that has been determined to be unacceptable for use
3. Data that may be conditionally used and that is flagged as per SWAMP specification

D2, Element 23. Verification and Validation Methods

Defining the methods for data verification and validation helps to ensure that project data are evaluated objectively and consistently. Information on these methods is provided below.

All data records for the proposed project will be checked visually and will be recorded as checked by the checker's initials as well as with the dates on which the records were checked.

All of the laboratory's data will be checked as part of the verification methodology process.

Any data that is discovered to be incorrect or missing during the verification or validation process will immediately be reported to the Monitoring Lead. If errors involve laboratory data then this information will also be reported to the Monitoring Lead.

If there are any data quality problems, the monitoring lead will try to identify whether the problem is a result of project design issues, sampling issues, analytical methodology issues, or QA/QC issues (from laboratory or non-laboratory sources). If the source of the problems can be traced to one or more of these basic activities then the person or people in charge of the areas where the issues lie will be contacted and efforts will be made to immediately resolve the problem. If the issues are too broad or severe to be easily corrected then appropriate people involved will be assembled to discuss and try to resolve the issue(s) as a group. The Monitoring Lead has the final authority to resolve any issues that may be identified during the verification and validation process.

D3, Element 24. Reconciliation with User Requirements

Information from field data reports (including field activities, post sampling events, corrective actions, and audits), laboratory data reviews (including errors involving data entry, transcriptions, omissions, and calculations and laboratory audit reports), reviews of data versus MQOs, reviews against Quality Assurance and Quality Control (QA/QC) requirements, data verification reports, data validation reports, independent data checking reports, and error handling reports will be used to determine whether or not the project's objectives have been met.

Data from all monitoring measurements will be summarized in tables. During the quarterly review, data that show significant changes over time during the monitoring period will be plotted in graphs and charts. There are no known limitations that are inherent to the data to be collected for this study. Explanations will be provided for any data determined unacceptable for use or flagged for QA/QC concerns.

The proposed project will provide data for the selected analytes described in Element 6. All data will be readily available to all those involved in this project.

The above evaluations will provide a comprehensive assessment of how well the project meets its objectives. No other evaluations will be used.

The Project Lead and Monitoring Lead will be responsible for reporting project reconciliation. This will include measurements of how well the project objectives were met. When resources become available, the data will be entered into CEDEN templates in order to be loaded into the CEDEN database.

This section describes how validated data will be evaluated to see if it answers the project objectives outlined in A5, Element 5.

APPENDICES

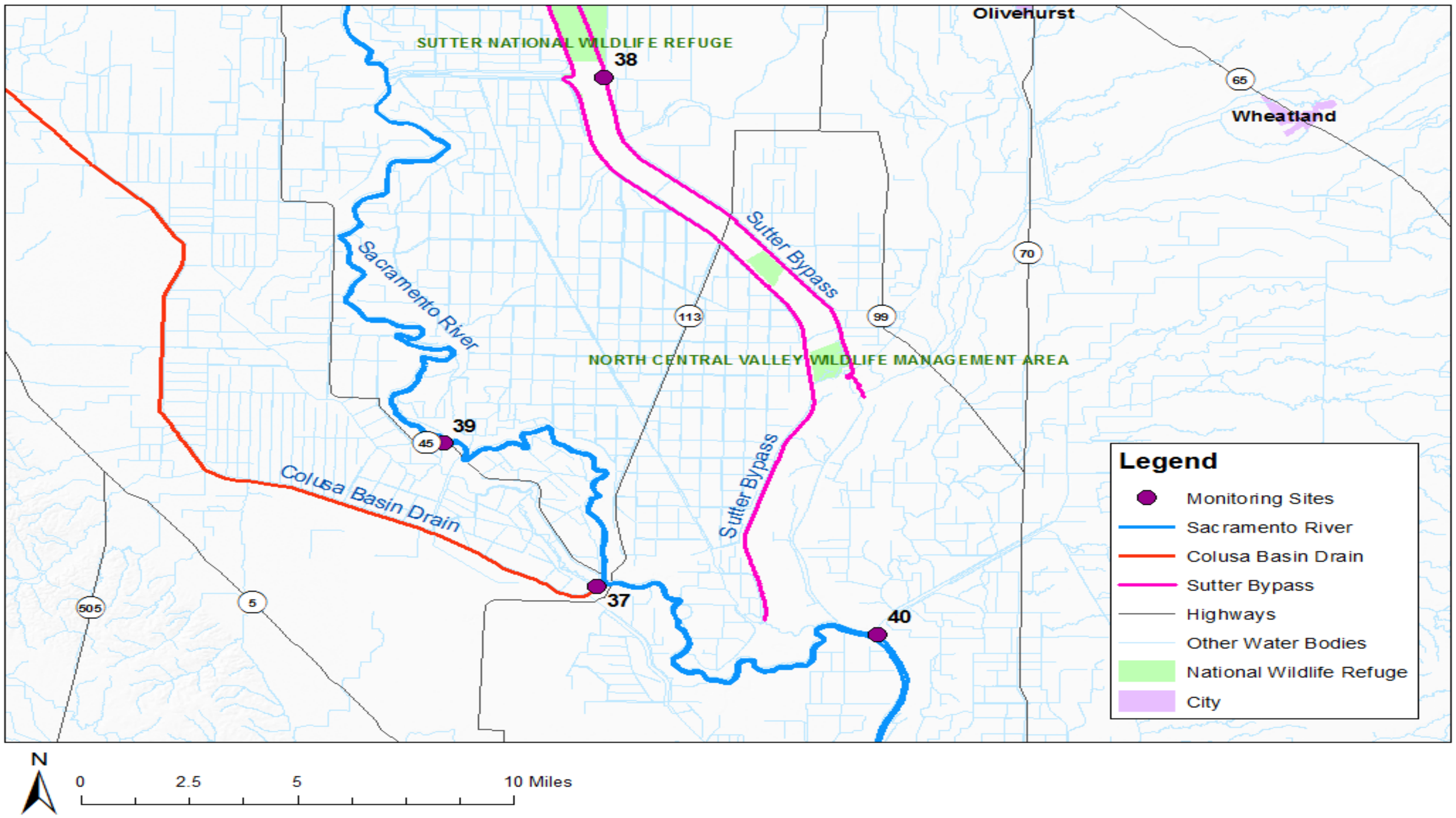
Appendix 1. List of Sampling Sites

Location	***Map Label***	***Sites***	***Latitude***	***Longitude***
Sacramento River	37	**Colusa Basin Drain** above Knights Landing	38.7992	-121.725
	38	**Sutter Bypass** downstream of Obanion Outfall	39.0258	-121.7272
	39	**Sacramento River** at Rough and Ready Pumping Plant	38.8621	-121.7927
	40	**Sacramento River** Below Verona	38.7797	-121.6037
San Joaquin River	30	**Salt Slough** at Lander Avenue	37.24797	-120.85225
	31	**Salt Slough** at Sand Dam	37.13664	-120.76194
	32	**Boundary Drain** at SLCC Sampling Station	37.10949	-120.78275
	33	**San Joaquin River** at Crows Landing	37.43323	-121.01597
	34	**Harding Drain**	37.46444	-121.03028
	35	**San Joaquin River** at Airport Way near Vernalis	37.67556	-121.26417
	36	**Del Puerto Creek** at Vineyard Road	37.52139	-121.14861

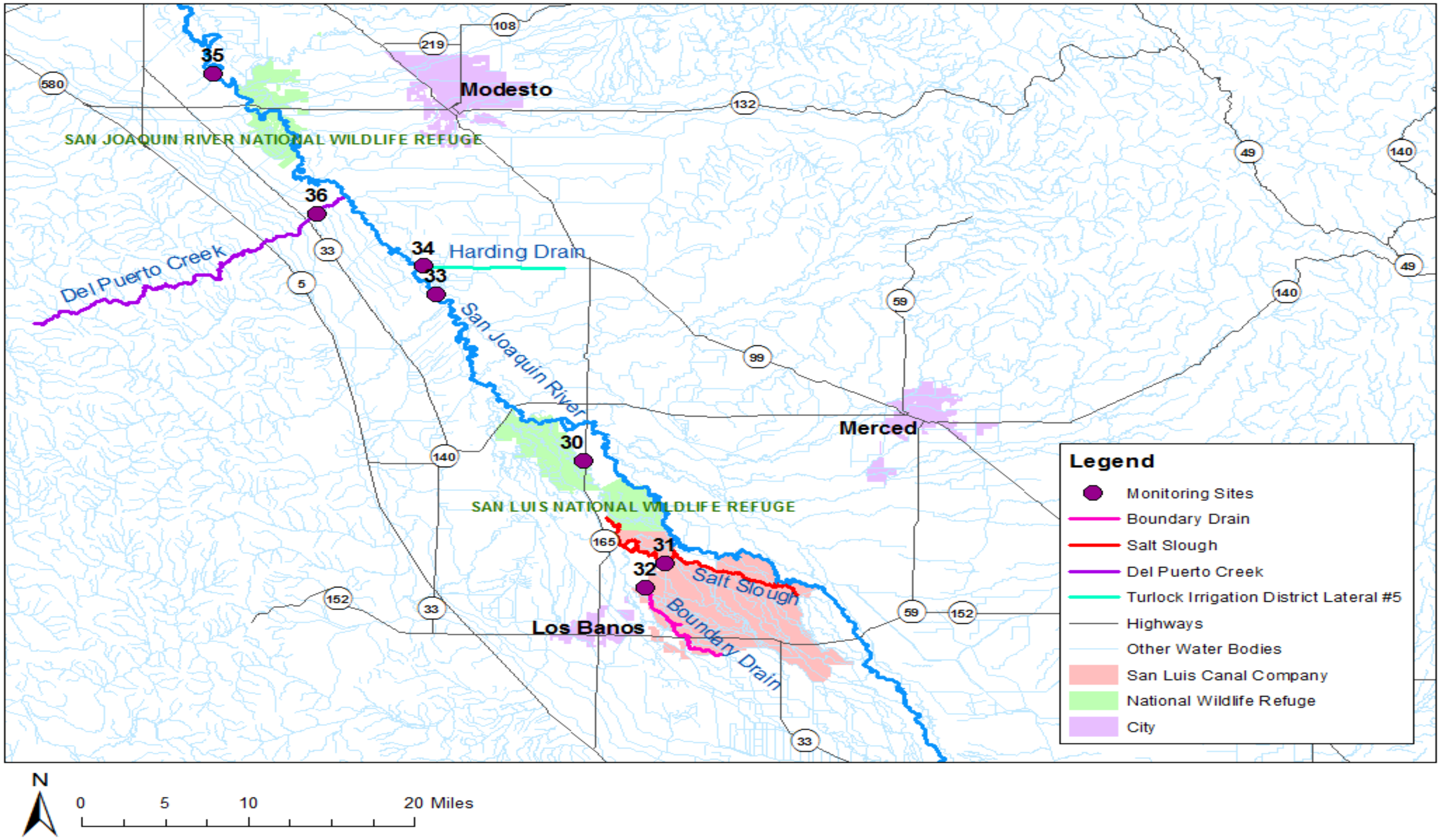
NOTE: Map Labels match locations depicted in Appendix 2.

Appendix 2. Map of Sampling Sites

Sacramento River Basin Sampling Sites



San Joaquin River Basin Sampling Sites



Appendix 3. Monitoring Plan

Synoptic Evaluation of Drinking Water Constituents of Concern in Sacramento and San Joaquin River Basins

Final Monitoring Plan

November 2014

I. INTRODUCTION

This plan documents the monitoring aspects of the Synoptic Evaluation of Drinking Water Constituents of Concern in the Sacramento and San Joaquin River Basins conducted during June 2014. The purpose of this study is to evaluate current water quality data within representative agricultural drains and main stem Sacramento and San Joaquin river sites against Maximum Contaminant Levels (MCLs) specified in provisions of Title 22 of the California Code of Regulations, California Toxics Rule (CTR) criteria, and other numeric water quality criteria listed in Appendix A for constituents without a MCL or CTR criteria developed to protect human health. Sampling of the study's 11 sites will be conducted over two days, and each designated site will be sampled once for this study.

Sampling sites consist of:

- Locations that are utilized by other programs gathering water quality data
- Locations at representative agricultural drains
- Locations in the main river stems upstream and downstream of agricultural drain inflows

Parameters analyzed will include standard field measurements and bacteria (coliform and *E. coli*) in addition to constituents that fall under the criteria listed above. *E. coli* will be compared to the USEPA Recreational Guideline for Designated Beach Area at 235 MPN/100mL (USEPA, 1986). This numeric water quality criterion will be strictly used as a tool for evaluation to put values into context in terms of spatial and temporal trends.

II. BACKGROUND

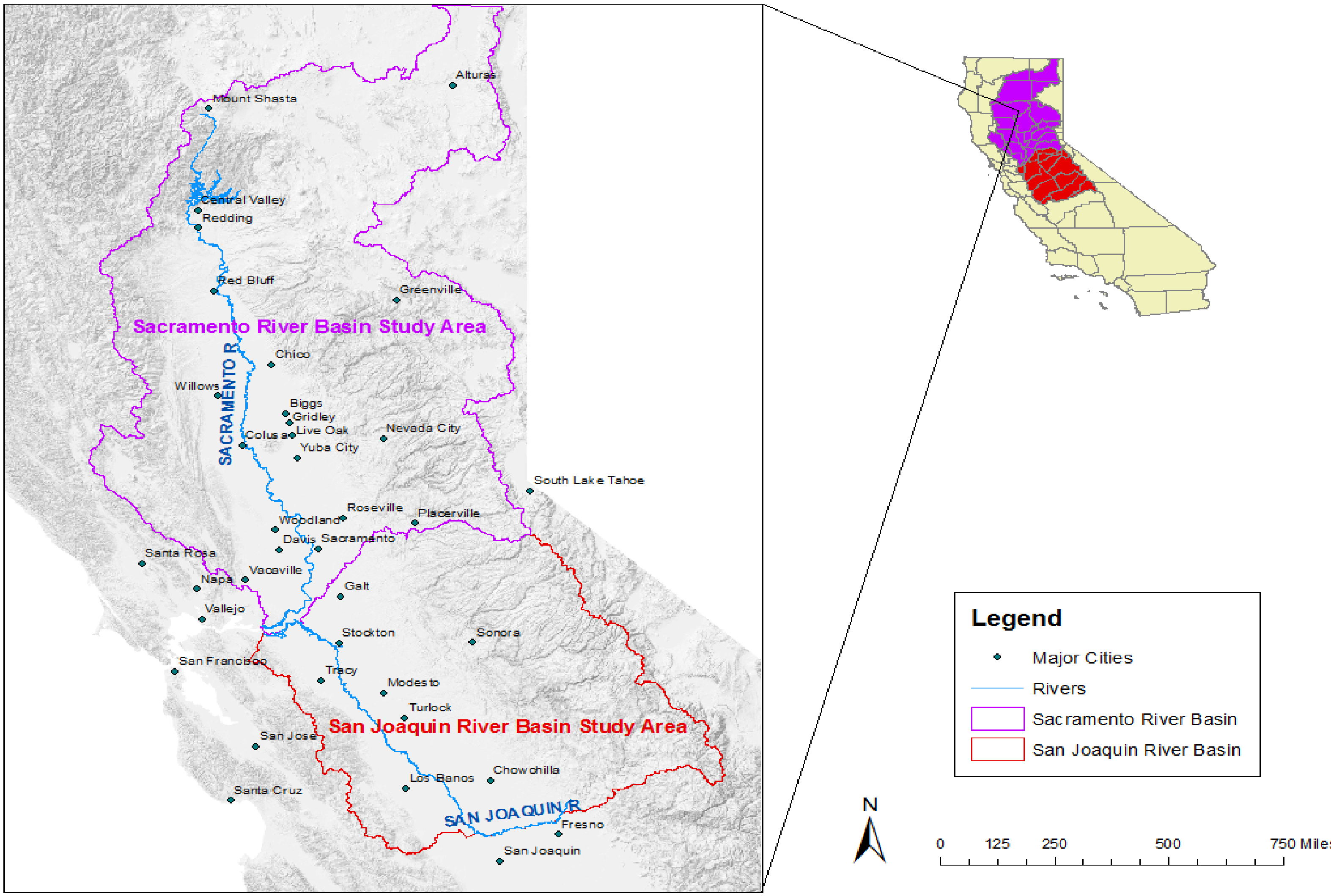
Via the State Water Resources Control Board Sources of Drinking Water Policy (88-63), the Central Valley Regional Water Quality Control Board Basin Plans (Basin Plans) designate with the Municipal and Domestic Supply (MUN) beneficial use to all water bodies unless they are specifically listed as water bodies without MUN. The Basin Plans state that water bodies designated for MUN must not exceed MCLs for chemical constituents, pesticides, and radionuclides.

This project will provide a snapshot of the water quality within select agricultural dominated drains and sites along the main stem of the San Joaquin and Sacramento Rivers as compared to criteria developed to protect human health.

III. STUDY DESIGN OVERVIEW

This Monitoring Plan has been formatted to reflect California's Surface Water Ambient Monitoring Program's (SWAMP's) template. The following sections provide details of the plan, including questions to be answered, constituents to be analyzed, sampling sites and frequency. Figure 1 displays the study area.

Figure 2 Study Area



III.a. Monitoring Design

This monitoring effort will evaluate water quality along the Sacramento River and San Joaquin River against criteria developed to protect human health; specifically the Title 22 primary and secondary MCLs and select constituents identified in the California Toxics Rule. The analytes and their associated criteria are listed in Appendix A.

The main question being asked by this study is:

1. During a one time snapshot of the irrigation period, do agricultural return flows exceed or cause the main stems of the Sacramento and/or San Joaquin Rivers to exceed potable water quality criteria?

The primary objectives of this project are:

- Collect representative samples in main agricultural drains discharging into either the Sacramento or San Joaquin Rivers and the rivers themselves;
- Determine spatial distribution of any detectible constituent concentrations of concern; and,
- Identify whether criteria developed to protect human health are exceeded.

All aspects of this study, including all samples and field measurements collected, will be conducted in accordance with the Procedures Manual for the San Joaquin River Water Quality Monitoring Program (Central Valley Water Board, 2010) which is compliant with the 2008 SWAMP Quality Assurance Program Plan (QAPrP) for the State of California's Surface Water Ambient Monitoring Program (State Water Board, 2008).

III.b. Sampling Locations

Eleven sites have been selected for sampling (Table 1). Sites were selected based on accessibility, presence of water, agricultural area drained, and for the main stem rivers, proximity to agricultural drains. Consideration was also given to potential use of the resulting data by other programs and agencies. Figures 2 and 3 are maps of the sampling locations.

Table 14 Monitoring Sites (Water bodies are in **bold**)

Location	Map Label	Station Code	Sites	Latitude	Longitude
Sacramento River	37	520CBDKLU	**Colusa Basin Drain** above Knights Landing	38.7992	-121.725
	38	520CRCOOH	**Sutter Bypass** downstream of Obanion Outfall	39.0258	-121.7272
	39	520YOL001	**Sacramento River** at Rough and Ready Pumping Plant	38.8621	-121.7927
	40	519SACVER	**Sacramento River** Below Verona	38.7797	-121.6037
San Joaquin River	30	541MER531	**Salt Slough** at Lander Avenue	37.24797	-120.85225
	31	541XSSASD	**Salt Slough** at Sand Dam	37.13664	-120.76194
	32	541MER050	**Boundary Drain** at SLCC Sampling Station	37.10949	-120.78275
	33	535STC504	**San Joaquin River** at Crows Landing	37.43323	-121.01597
	34	535STC501	**Harding Drain**	37.46444	-121.03028
	35	541SJC501	**San Joaquin River** at Airport Way near Vernalis	37.67556	-121.26417
	36	541STC516	**Del Puerto Creek** at Vineyard Road	37.52139	-121.14861

NOTE: Map Labels match locations depicted in Figures 2 and 3.

Water Quality Evaluation Sites Maps

Figure 3 Sacramento River Monitoring Sites

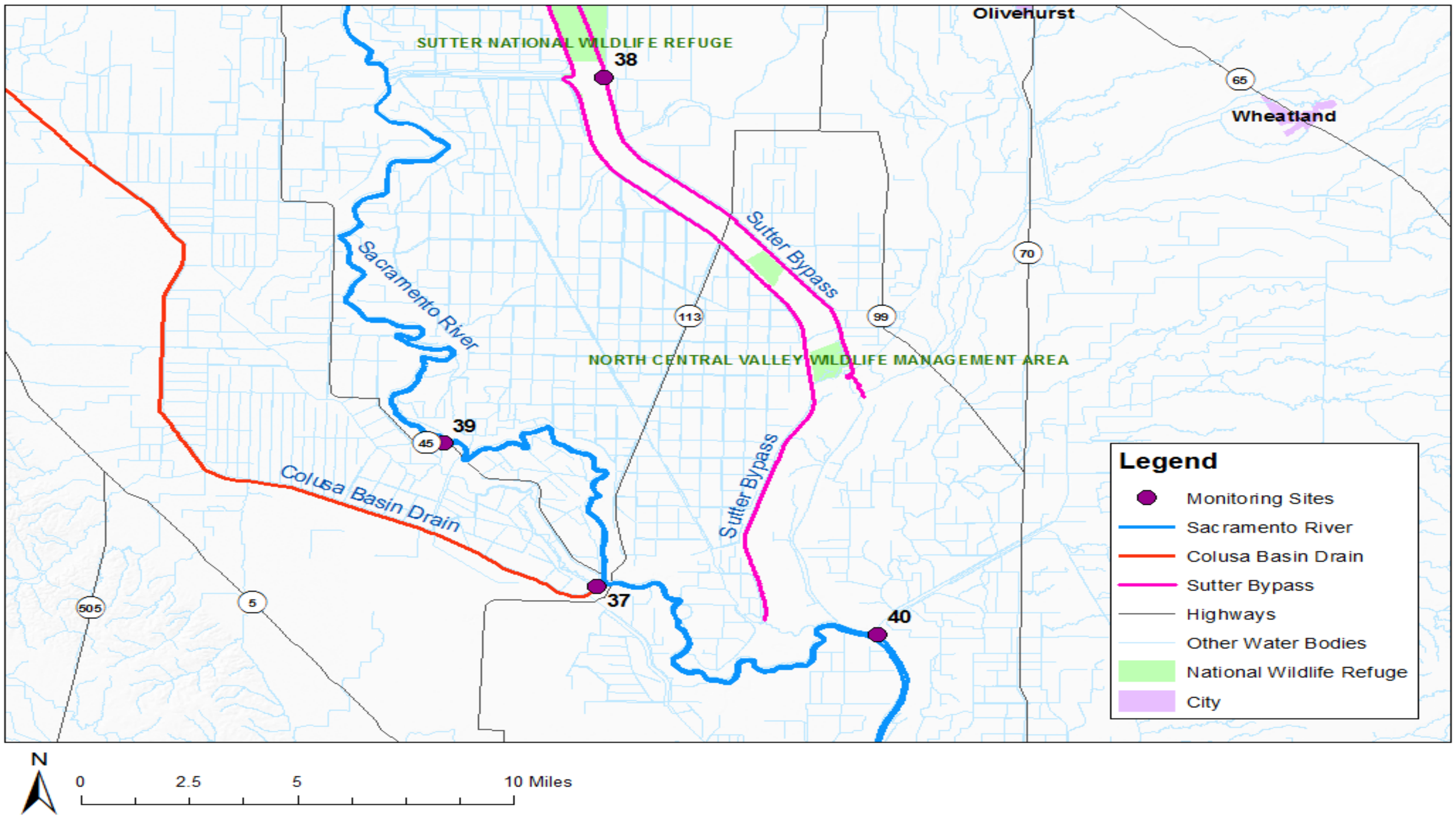
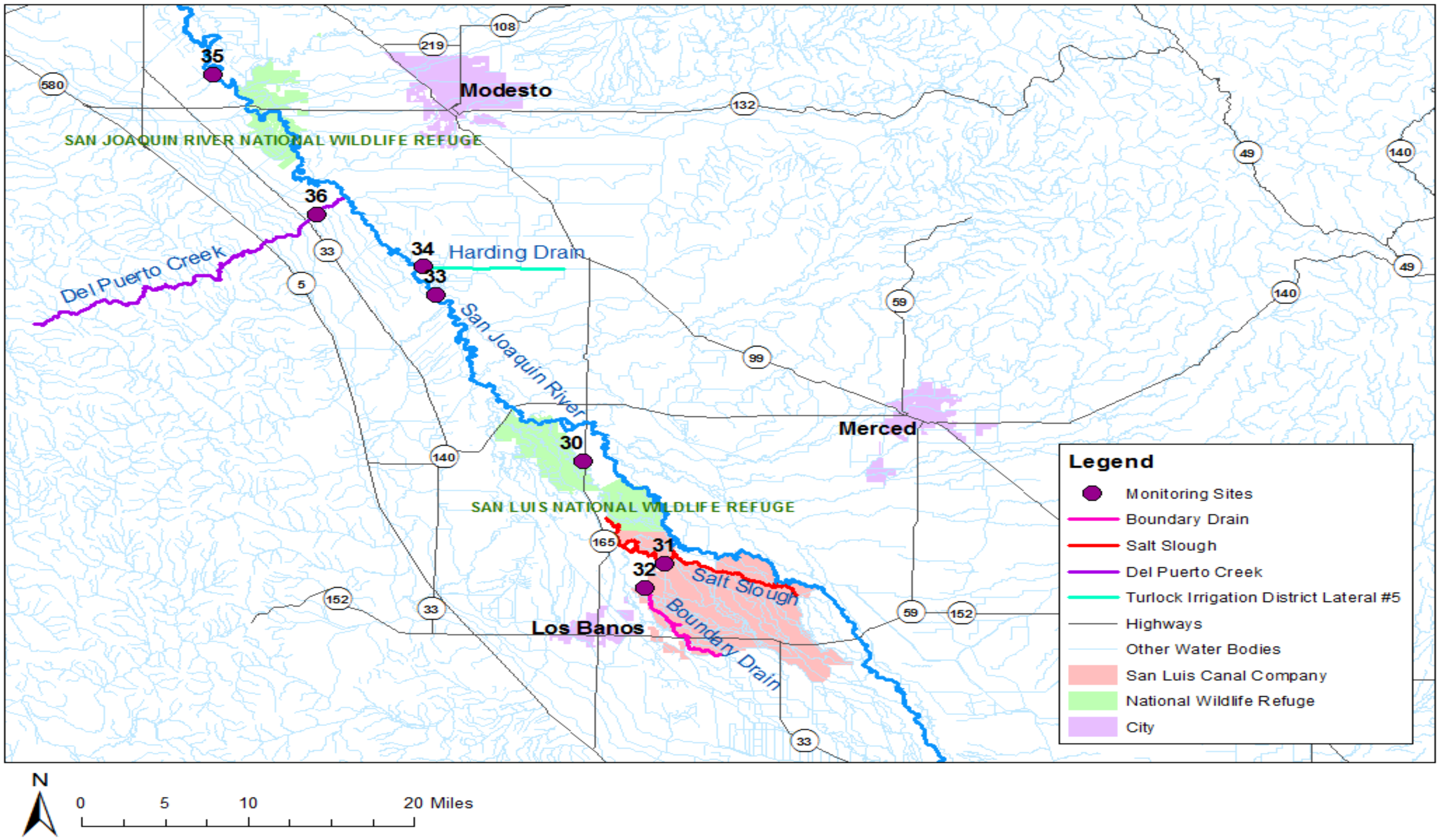


Figure 4 San Joaquin River Monitoring Sites



III.c. Parameters

III.c.1 Field Parameters

Field parameters will include temperature, dissolved oxygen, pH, specific conductivity and turbidity. A YSI EXO1 multiparameter water quality monitor will be used to collect data for temperature, dissolved oxygen, pH and specific conductivity. Turbidity measurements will be collected with a Hach 2100P turbidimeter. The field equipment will be calibrated using certified calibration standards and following the manufacturer specifications prior to and following each sampling event. Calibration records are maintained at the Regional Board office and are used to determine instrument accuracy.

Photos will be taken at each sampling site visited. A digital camera will be used to take one photo upstream of sampling location, one photo looking straight ahead at sampling location, and one photo downstream of sampling location.

III.c.2 Laboratory Analysis

This study will analyze for Maximum Contaminant Levels (MCLs) specified in provisions of Title 22 of the California Code of Regulations, California Toxics Rule (CTR) criteria, and other numeric water quality criteria listed in Appendix A for constituents without a MCL or CTR criteria. For constituents with both a MCL and CTR criteria, the most conservative numeric threshold was selected for water quality evaluation. For constituents without a MCL and CTR criteria, the most appropriate for protecting MUN beneficial use numeric water quality criteria was selected for water quality evaluation.

Table 2 lists the major analytical scans that will be conducted by Excelchem laboratory for each sample site.

E. coli samples will be processed by qualified staff members at the Central Valley Regional Water Quality Control Board using an IDEXX system and methods specified in the Procedures Manual for the San Joaquin River Water Quality Monitoring Program (Central Valley Water Board, 2010).

Table 15 List of Constituents within Each Scan including RLs and MDLs

Scan	Analyte	RL	MDL	Unit	Test Method
Volatile Organic Compounds (VOCs) by GC/MS	1, 1-Dichloroethane	0.5	0.04	µg/L	EPA 8260B
	1,1,1,2-Tetrachloroethane	0.5	0.08	µg/L	EPA 8260B
	1,1,1-Trichloroethane	0.5	0.05	µg/L	EPA 8260B
	1,1,2,2-Tetrachloroethane	0.5	0.4	µg/L	EPA 8260B
	1,1,2-Trichloroethane	0.5	0.1	µg/L	EPA 8260B
	1,1-Dichloroethane	0.5	0.05	µg/L	EPA 8260B
	1,1-Dichloropropene	0.5	0.03	µg/L	EPA 8260B
	1,2,3-Trichlorobenzene	0.5	0.05	µg/L	EPA 8260B
	1,2,3-Trichloropropane	0.5	0.06	µg/L	EPA 8260B
	1,2,4-Trichlorobenzene	0.5	0.02	µg/L	EPA 8260B
	1,2,4-Trimethylbenzene	0.5	0.04	µg/L	EPA 8260B
	1,2-Dibromo-3-chloropropane	0.5	0.07	µg/L	EPA 8260B
	1,2-Dibromoethane (EDB)	0.5	0.1	µg/L	EPA 8260B
	1,2-Dichlorobenzene	0.5	0.06	µg/L	EPA 8260B
	1,2-Dichloroethane	0.5	0.04	µg/L	EPA 8260B
	1,2-Dichloropropane	0.5	0.06	µg/L	EPA 8260B
	1,3-Dichlorobenzene	0.5	0.03	µg/L	EPA 8260B
	1,3-Dichloropropane	0.5	0.06	µg/L	EPA 8260B
	1,4-Dichlorobenzene	0.5	0.05	µg/L	EPA 8260B
	2-Butanone	5.0	0.1	µg/L	EPA 8260B
	2-Chlorotoluene	0.5	0.03	µg/L	EPA 8260B
	2-Hexanone	5.0	0.1	µg/L	EPA 8260B
	4-Chlorotoluene	0.5	0.05	µg/L	EPA 8260B
	4-Isopropyltoluene	0.5	0.04	µg/L	EPA 8260B
	4-Methyl1-2pentanone	5.0	0.05	µg/L	EPA 8260B
	Acetone	5.0	0.1	µg/L	EPA 8260B
	Benzene	0.5	0.03	µg/L	EPA 8260B
	Bromobenzene	0.5	0.05	µg/L	EPA 8260B
	Bromochloromethane	0.5	0.07	µg/L	EPA 8260B
	Bromodichloromethane	0.5	0.05	µg/L	EPA 8260B
	Bromoform	0.5	0.03	µg/L	EPA 8260B
	Bromomethane	0.5	0.05	µg/L	EPA 8260B
	Carbon disulfide	0.5	0.06	µg/L	EPA 8260B
	Carbon tetrachloride	0.5	0.02	µg/L	EPA 8260B
	Chlorobenzene	0.5	0.03	µg/L	EPA 8260B
	Chloroethane	0.5	0.08	µg/L	EPA 8260B
	Chloroform	0.5	0.05	µg/L	EPA 8260B

Scan	Analyte	RL	MDL	Unit	Test Method
VOCs by GC/MS cont'd	Chloromethane	0.5	0.06	µg/L	EPA 8260B
	cis-1,2-Dichloroethane	0.5	0.03	µg/L	EPA 8260B
	cis-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 8260B
	Dibromochloromethane	0.5	0.07	µg/L	EPA 8260B
	Dibromomethane	0.5	0.07	µg/L	EPA 8260B
	Dichlorodifluoromethane	0.5	0.07	µg/L	EPA 8260B
	Di-isopropyl ether	0.5	0.1	µg/L	EPA 8260B
	Ethyl tert-Butyl Ether	0.5	0.04	µg/L	EPA 8260B
	Ethylbenzene	0.5	0.03	µg/L	EPA 8260B
	Hexachlorobutadiene	0.5	0.07	µg/L	EPA 8260B
	Iodomethane	0.5	0.03	µg/L	EPA 8260B
	Isopropylbenzene	0.5	0.04	µg/L	EPA 8260B
	m,p-Xylene	1.0	0.09	µg/L	EPA 8260B
	Methyl tert-Butyl Ether	0.5	0.05	µg/L	EPA 8260B
	Methylene chloride	5.0	0.08	µg/L	EPA 8260B
	Naphthalene	0.5	0.04	µg/L	EPA 8260B
	n-Butylbenzene	0.5	0.04	µg/L	EPA 8260B
	n-Propylbenzene	0.5	0.04	µg/L	EPA 8260B
	o-Xylene	0.5	0.04	µg/L	EPA 8260B
	sec-Butylbenzene	0.5	0.03	µg/L	EPA 8260B
	TBA	1.0	0.1	µg/L	EPA 8260B
	Tert-Amyl Methyl Ether	0.5	0.03	µg/L	EPA 8260B
	tert-Butylbenzene	0.5	0.02	µg/L	EPA 8260B
	Tetrachloroethene	0.5	0.08	µg/L	EPA 8260B
	Toluene	0.5	0.04	µg/L	EPA 8260B
	trans-1,2-Dichloroethane	0.5	0.04	µg/L	EPA 8260B
	trans-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 8260B
	Trichloroethane	0.5	0.06	µg/L	EPA 8260B
	Trichlorofluoromethane	0.5	0.05	µg/L	EPA 8260B
	Trichlorotrifluoroethane	1.0	0.05	µg/L	EPA 8260B
	Vinyl chloride	0.5	0.06	µg/L	EPA 8260B
	Xylenes, total	1.0	0.1	µg/L	EPA 8260B
	1,1,1,2-Tetrachloroethane	0.5	0.08	µg/L	EPA 524
	1,1,1-Trichloroethane	0.5	0.05	µg/L	EPA 524
	1,1,2,2-Tetrachloroethane	0.5	0.04	µg/L	EPA 524
	1,1,2-Trichloroethane	0.5	0.1	µg/L	EPA 524
	1,1,-Dichloroethane	0.5	0.04	µg/L	EPA 524
	1,1-Dichloroethane	0.5	0.05	µg/L	EPA 524
	1,1-Dichloropropene	0.5	0.03	µg/L	EPA 524
	1,2,3-Trichlorobenzene	0.5	0.05	µg/L	EPA 524

Scan	Analyte	RL	MDL	Unit	Test Method
VOCs by GC/MS cont'd	1,2,3-Trichloropropane	0.5	0.06	µg/L	EPA 524
	1,2,4-Trichlorobenzene	0.5	0.02	µg/L	EPA 524
	1,2,4-Trimethylbenzene	0.5	0.04	µg/L	EPA 524
	1,2-Dibromo-3-chloropropane	0.5	0.07	µg/L	EPA 524
	1,2-Dibromoethane (EDB)	0.5	0.1	µg/L	EPA 524
	1,2-Dichlorobenzene	0.5	0.06	µg/L	EPA 524
	1,2-Dichloroethane	0.5	0.06	µg/L	EPA 524
	1,2-Dichloropropane	0.5	0.06	µg/L	EPA 524
	1,3,5-Trimethylbenzene	0.5	0.03	µg/L	EPA 524
	1,3-Dichlorobenzene	0.5	0.03	µg/L	EPA 524
	1,3-Dichloropropane	0.5	0.06	µg/L	EPA 524
	1,4-Dichlorobenzene	0.5	0.05	µg/L	EPA 524
	2,2-Dichloropropane	0.5	0.06	µg/L	EPA 524
	2-Butanone	5.0	0.1	µg/L	EPA 524
	2-Chlorotoluene	0.5	0.03	µg/L	EPA 524
	2-Hexanone	0.5	0.1	µg/L	EPA 524
	4-Chlorotoluene	0.5	0.05	µg/L	EPA 524
	4-Isopropyltoluene	0.5	0.04	µg/L	EPA 524
	4-Methyl-2-pentanone	0.5	0.05	µg/L	EPA 524
	Acetone	5.0	0.1	µg/L	EPA 524
	Benzene	0.5	0.03	µg/L	EPA 524
	Bromobenzene	0.5	0.05	µg/L	EPA 524
	Bromochloromethane	0.5	0.07	µg/L	EPA 524
	Bromodichloromethane	0.5	0.05	µg/L	EPA 524
	Bromoform	0.5	0.03	µg/L	EPA 524
	Bromomethane	0.5	0.05	µg/L	EPA 524
	Carbon disulfide	0.5	0.06	µg/L	EPA 524
	Carbon tetrachloride	0.5	0.02	µg/L	EPA 524
	Chlorobenzene	0.5	0.03	µg/L	EPA 524
	Chloroethane	0.5	0.08	µg/L	EPA 524
	Chloroform	0.5	0.05	µg/L	EPA 524
	Chloromethane	0.5	0.06	µg/L	EPA 524
	cis-1,2-Dichloroethane	0.5	0.03	µg/L	EPA 524
	cis-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 524
	Dibromochloromethane	0.5	0.07	µg/L	EPA 524
	Dibromomethane	0.5	0.07	µg/L	EPA 524
	Dichlorodifluoromethane	0.5	0.07	µg/L	EPA 524
	Di-isopropyl ether	0.5	0.1	µg/L	EPA 524
	Ethyl tert-Butyl Ether	0.5	0.04	µg/L	EPA 524

Scan	Analyte	RL	MDL	Unit	Test Method
VOCs by GC/MS cont'd	Ethylbenzene	0.5	0.03	µg/L	EPA 524
	Hexachlorobutadiene	0.5	0.07	µg/L	EPA 524
	Iodomethane	0.5	0.03	µg/L	EPA 524
	Isopropylbenzene	0.5	0.04	µg/L	EPA 524
	m,p-Xylene	0.5	0.09	µg/L	EPA 524
	Methyl tert-Butyl Ether	0.5	0.05	µg/L	EPA 524
	Methylene chloride	1.0	0.08	µg/L	EPA 524
	Naphthalene	0.5	0.04	µg/L	EPA 524
	n-Butylbenzene	0.5	0.04	µg/L	EPA 524
	n-Propylbenzene	0.5	0.04	µg/L	EPA 524
	o-Xylene	0.5	0.04	µg/L	EPA 524
	sec-Butylbenzene	0.5	0.03	µg/L	EPA 524
	Styrene	0.5	0.09	µg/L	EPA 524
	TBA	1.0	0.1	µg/L	EPA 524
	Tert-Amyl Methyl Ether	0.5	0.03	µg/L	EPA 524
	tert-Butylbenzene	0.5	0.02	µg/L	EPA 524
	Tetrachloroethene	0.5	0.08	µg/L	EPA 524
	Toluene	0.5	0.04	µg/L	EPA 524
	Total Trihalomethanes	0.5	0.5	µg/L	EPA 524
	trans-1,2-Dichloroethane	0.5	0.04	µg/L	EPA 524
	trans-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 524
	Trichloroethane	0.5	0.06	µg/L	EPA 524
	Trichlorofluoromethane	0.5	0.05	µg/L	EPA 524
	Trichlorotrifluoroethane	1.0	0.05	µg/L	EPA 524
	Vinyl chloride	0.5	0.06	µg/L	EPA 524
	Xylenes, total	1.0	0.1	µg/L	EPA 524
Pesticides by GC/ECD	4,4'-DDD	0.1	0.006	µg/L	EPA 8081A
	4,4'-DDE	0.1	0.005	µg/L	EPA 8081A
	4,4'-DDT	0.1	0.004	µg/L	EPA 8081A
	Aldrin	0.1	0.011	µg/L	EPA 8081A
	alpha-BHC	0.1	0.011	µg/L	EPA 8081A
	alpha-Chlordane	0.1	0.006	µg/L	EPA 8081A
	beta-BHC	0.1	0.011	µg/L	EPA 8081A
	delta-BHC	0.1	0.021	µg/L	EPA 8081A
	Dieldrin	0.1	0.006	µg/L	EPA 8081A
	Endosulfan I	0.1	0.007	µg/L	EPA 8081A
	Endosulfan II	0.1	0.021	µg/L	EPA 8081A
	Endosulfan sulfate	0.1	0.005	µg/L	EPA 8081A
	Endrin	0.1	0.007	µg/L	EPA 8081A
	Endrin aldehyde	0.1	0.006	µg/L	EPA 8081A

Scan	Analyte	RL	MDL	Unit	Test Method
Pesticides by GC/ECD cont'd	Endrin Ketone	0.1	0.005	µg/L	EPA 8081A
	gamma-BHC (Lindane)	0.1	0.013	µg/L	EPA 8081A
	gamma-Chlordane	0.1	0.005	µg/L	EPA 8081A
	Heptachlor	0.1	0.016	µg/L	EPA 8081A
	Heptachlor epoxide	0.1	0.02	µg/L	EPA 8081A
	Methoxychlor	0.1	0.013	µg/L	EPA 8081A
PCBs by GC/ECD	Aroclor 1016	1.00	0.0600	µg/L	EPA 8081A
	Aroclor 1221	1.00	0.130	µg/L	EPA 8081A
	Aroclor 1232	1.00	0.100	µg/L	EPA 8081A
	Aroclor 1242	1.00	0.0600	µg/L	EPA 8081A
	Aroclor 1248	1.00	0.0600	µg/L	EPA 8081A
	Aroclor 1254	1.00	0.0900	µg/L	EPA 8081A
	Aroclor 1260	1.00	0.0800	µg/L	EPA 8081A
	PCBs	1.00	0.0800	µg/L	EPA 8081A
SemiVolatile Organic Compounds by GC/MS	1,2,4-Trichlorobenzene	2.0	0.6	µg/L	EPA 8270C
	1,4-Dichlorobenzene	2.0	0.4	µg/L	EPA 8270C
	2,4,5-Trichlorophenol	5.0	1.6	µg/L	EPA 8270C
	2,4,6-Trichlorophenol	5.0	1.6	µg/L	EPA 8270C
	2,4-Dichlorophenol	2.0	0.8	µg/L	EPA 8270C
	2,4-Dimethylphenol	2.0	0.8	µg/L	EPA 8270C
	2,4-Dinitrophenol	10.0	0.3	µg/L	EPA 8270C
	2,4-Dinitrotoluene	2.0	0.8	µg/L	EPA 8270C
	2,6-Dinitrotoluene	2.0	0.8	µg/L	EPA 8270C
	2-Chloronaphthalene	2.0	0.2	µg/L	EPA 8270C
	2-Chlorophenol	2.0	0.8	µg/L	EPA 8270C
	2-Methylnaphthalene	2.0	0.6	µg/L	EPA 8270C
	2-Methylphenol	2.0	0.4	µg/L	EPA 8270C
	2-Nitroaniline	2.0	0.4	µg/L	EPA 8270C
	2-Nitrophenol	2.0	1.2	µg/L	EPA 8270C
	3,3´-Dichlorobenzidine	5.0	0.8	µg/L	EPA 8270C
	3-Nitroaniline	2.0	0.5	µg/L	EPA 8270C
	4,6-Dinitro-2-methylphenol	10.0	2.2	µg/L	EPA 8270C
	4-Bromophenyl phenyl ether	2.0	0.8	µg/L	EPA 8270C
	4-Chloro-3-methylphenol	2.0	0.6	µg/L	EPA 8270C
	4-Chloroaniline	2.0	0.5	µg/L	EPA 8270C
	4-Chlorophenyl phenyl ether	2.0	0.5	µg/L	EPA 8270C
	4-Nitroaniline	2.0	0.6	µg/L	EPA 8270C
	4-Nitrophenol	5.0	0.1	µg/L	EPA 8270C
	Acenaphthene	2.0	0.6	µg/L	EPA 8270C

Scan	Analyte	RL	MDL	Unit	Test Method
SemiVolatile Organic Compounds by GC/MS	Acenaphthylene	2.0	0.3	µg/L	EPA 8270C
	Aniline	2.0	0.3	µg/L	EPA 8270C
	Anthracene	2.0	0.3	µg/L	EPA 8270C
	Azobenzene	2.0	0.4	µg/L	EPA 8270C
	Benzidine	5.0	0.2	µg/L	EPA 8270C
	Benzo (a) anthracene	2.0	0.4	µg/L	EPA 8270C
	Benzo (a) pyrene	5.0	1.2	µg/L	EPA 8270C
	Benzo (b) fluoranthene	2.0	0.8	µg/L	EPA 8270C
	Benzo (g,h,i) perylene	2.0	1.3	µg/L	EPA 8270C
	Benzo (k) fluoranthene	2.0	1.0	µg/L	EPA 8270C
	Benzoic acid	30.0	0.5	µg/L	EPA 8270C
	Benzyl alcohol	2.0	0.4	µg/L	EPA 8270C
	Bis(2-chloroethoxy)methane	2.0	0.4	µg/L	EPA 8270C
	Bis(2-chloroethyl)ether	2.0	0.6	µg/L	EPA 8270C
	Bis(2-chloroisopropyl)ether	2.0	0.4	µg/L	EPA 8270C
	Bis(2-ethylhexyl)phthalate	5.0	0.7	µg/L	EPA 8270C
	Butyl benzyl phthalate	2.0	1.0	µg/L	EPA 8270C
	Carbazole	2.0	0.6	µg/L	EPA 8270C
	Chrysene	2.0	0.5	µg/L	EPA 8270C
	Dibenz (a,h) anthracene	2.0	1.6	µg/L	EPA 8270C
	Dibenzofuran	2.0	0.3	µg/L	EPA 8270C
	Diethyl phthalate	2.0	0.6	µg/L	EPA 8270C
	Dimethyl phthalate	2.0	0.8	µg/L	EPA 8270C
	Di-n-butyl phthalate	2.0	0.4	µg/L	EPA 8270C
	Di-n-octyl phthalate	5.0	0.7	µg/L	EPA 8270C
	Fluoranthene	2.0	0.6	µg/L	EPA 8270C
	Fluorene	2.0	0.5	µg/L	EPA 8270C
	Hexachlorobenzene	2.0	0.6	µg/L	EPA 8270C
	Hexachlorobutadiene	2.0	0.6	µg/L	EPA 8270C
	Hexachlorocyclopentadiene	2.0	0.6	µg/L	EPA 8270C
	Hexachloroethane	2.0	0.5	µg/L	EPA 8270C
	Indeno (1,2,3-cd) pyrene	5.0	1.6	µg/L	EPA 8270C
	Isophorone	2.0	0.3	µg/L	EPA 8270C
	Naphthalene	2.0	0.5	µg/L	EPA 8270C
	Nitrobenzene	2.0	0.7	µg/L	EPA 8270C
Organophosphorus Pesticides	N-Nitrosodimethylamine	2.0	0.4	µg/L	EPA 8270C
	N-Nitrosodi-n-propylamine	2.0	0.3	µg/L	EPA 8270C
	N-Nitrosodiphenylamine	2.0	0.6	µg/L	EPA 8270C

Scan	Analyte	RL	MDL	Unit	Test Method
Organophosphorus Pesticides cont'd	Pentachlorophenol	10.0	2.4	µg/L	EPA 8270C
	Phenanthrene	2.0	0.4	µg/L	EPA 8270C
	Phenol	2.0	0.3	µg/L	EPA 8270C
	Pyrene	2.0	1.0	µg/L	EPA 8270C
	Azinphos-methyl	0.200	0.0270	µg/L	EPA 8141A
	Bolstar	0.200	0.0860	µg/L	EPA 8141A
	Coumaphos	0.200	0.168	µg/L	EPA 8141A
	Demeton	0.200	0.105	µg/L	EPA 8141A
	Demeton-O	0.200	0.101	µg/L	EPA 8141A
	Demeton-S	0.200	0.105	µg/L	EPA 8141A
	Diazinon	0.250	0.0650	µg/L	EPA 8141A
	Dichlorvos	0.200	0.156	µg/L	EPA 8141A
	Dimethoate	0.200	0.0710	µg/L	EPA 8141A
	Disulfoton	0.200	0.0690	µg/L	EPA 8141A
	Dursban (Chlorpyrifos)	0.200	0.0710	µg/L	EPA 8141A
	EPN	0.200	0.124	µg/L	EPA 8141A
	Ethoprop	0.200	0.0770	µg/L	EPA 8141A
	Fensulfothion	0.200	0.139	µg/L	EPA 8141A
	Fenthion	0.200	0.0670	µg/L	EPA 8141A
	Gardona (Stirophos)	0.200	0.110	µg/L	EPA 8141A
	Malathion	0.200	0.159	µg/L	EPA 8141A
	Merphos	0.200	0.0970	µg/L	EPA 8141A
	Mevinphos	0.200	0.115	µg/L	EPA 8141A
	Molinate	0.200	0.0440	µg/L	EPA 8141A
	Monocrotophos	0.200	0.0150	µg/L	EPA 8141A
	Naled	0.200	0.169	µg/L	EPA 8141A
	Parathion	0.200	0.0790	µg/L	EPA 8141A
	Parathion-methyl	0.200	0.0770	µg/L	EPA 8141A
	Phorate	0.200	0.0830	µg/L	EPA 8141A
	Ronnel	0.200	0.0660	µg/L	EPA 8141A
	Sulfotep	0.200	0.0950	µg/L	EPA 8141A
	TEPP	0.200	0.151	µg/L	EPA 8141A
	Tokuthion (Prothiofos)	0.200	0.0770	µg/L	EPA 8141A
	Trichloronate	0.200	0.0670	µg/L	EPA 8141A
Chlorinated Herbicides	2,4,5-T	0.500	0.0970	µg/L	EPA 8151A
	2,4,5-TP (Silvex)	0.500	0.0950	µg/L	EPA 8151A
	2,4-D	0.400	0.0860	µg/L	EPA 8151A
	2,4-DB	0.800	0.157	µg/L	EPA 8151A
	3,5-Dichlorobenzoic acid	0.800	0.170	µg/L	EPA 8151A
	4-Nitrophenol	0.600	0.117	µg/L	EPA 8151A

Scan	Analyte	RL	MDL	Unit	Test Method
Chlorinated Herbicides con'td	Acifluorfen	0.800	0.157	µg/L	EPA 8151A
	Bentazon	0.600	0.110	µg/L	EPA 8151A
	Chloramben	0.800	0.00800	µg/L	EPA 8151A
	Dalapon	0.600	0.115	µg/L	EPA 8151A
	DCPA	0.400	0.0150	µg/L	EPA 8151A
	Dicamba	0.400	0.0800	µg/L	EPA 8151A
	Dichloroprop	0.800	0.196	µg/L	EPA 8151A
	Dinoseb	0.400	0.0830	µg/L	EPA 8151A
	MCPP	10.0	0.891	µg/L	EPA 8151A
	Pentachlorophenol	0.300	0.0530	µg/L	EPA 8151A
	Picloram	0.800	0.0200	µg/L	EPA 8151A
Ion Chromatography	Hexavalent Chromium	1.0	0.1	µg/L	EPA 218.6
	Chloride	0.5	0.04	mg/L	EPA 300.0
	Fluoride	0.1	0.02	mg/L	EPA 300.0
	Nitrate as Nitrogen	0.11	0.009	mg/L	EPA 300.0
	Nitrite as Nitrogen	0.15	0.03	mg/L	EPA 300.0
	Sulfate as SO4	5.0	0.7	mg/L	EPA 300.0
	Perchlorate	2.00	0.0940	µg/L	EPA 314.0
Wet Chemistry	Specific Conductance (EC)	5.00	1.09	µS/cm	EPA 120.1
	Total Dissolved Solids	15.0	7.68	mg/L	SM 2540C
	Cyanide	0.00500	0.000900	mg/L	SM 4500CN E
	pH	0.100	0.100	pH Units	SM 4500-H+ B
	Ammonia as N	0.100	0.0400	mg/L	SM 4500-NH3 B/H
	MBAS	0.100	0.0600	mg/L	SM 5540C
	Total Alkalinity	5.00	2.37	mg/L	SM2320B
	Total Hardness	5.00	2.86	mg/L	SM2340B
Total Recoverable Metals	Aluminum	50.0	24.5	µg/L	EPA 200.7
	Antimony	10.0	1.3	µg/L	EPA 200.7
	Arsenic	10.0	1.0	µg/L	EPA 200.7
	Barium	5.0	1.2	µg/L	EPA 200.7
	Beryllium	5.0	0.09	µg/L	EPA 200.7
	Boron	50.0	0.8	µg/L	EPA 200.7
	Cadmium	5.0	0.1	µg/L	EPA 200.7
	Calcium	100	79.0	µg/L	EPA 200.7
	Chromium	5.0	0.3	µg/L	EPA 200.7
	Copper	5.0	0.8	µg/L	EPA 200.7
	Iron	20.0	11.5	µg/L	EPA 200.7
	Lead	5.0	0.9	µg/L	EPA 200.7

Scan	Analyte	RL	MDL	Unit	Test Method
Total Recoverable Metals con'td	Magnesium	50.0	15.6	µg/L	EPA 200.7
	Manganese	10.0	0.6	µg/L	EPA 200.7
	Nickel	5.0	0.6	µg/L	EPA 200.7
	Selenium	20.0	1.3	µg/L	EPA 200.7
	Silver	5.0	0.4	µg/L	EPA 200.7
	Sodium	200	120	µg/L	EPA 200.7
	Thallium	20.0	2.2	µg/L	EPA 200.7
	Titanium	50.0	1.2	µg/L	EPA 200.7
	Zinc	10.0	0.3	µg/L	EPA 200.7
Dissolved Metals	Dissolved Aluminum	50.0	24.5	µg/L	EPA 200.7
	Dissolved Arsenic	10.0	1.0	µg/L	EPA 200.7
	Dissolved Iron	20.0	11.5	µg/L	EPA 200.7
	Dissolved Lead	5.0	0.9	µg/L	EPA 200.7
Dixoin/Furan	1,2,3,4,6,7,8-HpCDD	50	2.17	pg/L	1613B
	1,2,3,4,6,7,8-HpCDF	50	3.77	pg/L	1613B
	1,2,3,4,7,8,9-HpCDF	50	4.61	pg/L	1613B
	1,2,3,4,7,8-HxCDD	50	3.98	pg/L	1613B
	1,2,3,4,7,8-HxCDF	50	3.66	pg/L	1613B
	1,2,3,6,7,8-HxCDD	50	5.34	pg/L	1613B
	1,2,3,6,7,8-HxCDF	50	3.97	pg/L	1613B
	1,2,3,7,8,9-HxCDD	50	4.68	pg/L	1613B
	1,2,3,7,8,9-HxCDF	50	8.74	pg/L	1613B
	1,2,3,7,8-PeCDD	50	2.29	pg/L	1613B
	1,2,3,7,8-PeCDF	50	2.58	pg/L	1613B
	2,3,4,6,7,8-HxCDF	50	4.97	pg/L	1613B
	2,3,4,7,8-PeCDF	50	2.36	pg/L	1613B
	2,3,7,8-TCDD	10	2.20	pg/L	1613B
	2,3,7,8-TCDF	10	2.01	pg/L	1613B
	OCDD	100	4.32	pg/L	1613B
	OCDF	100	6.25	pg/L	1613B
	TEQ			pg/L	1613B
	Total HpCDD	50	3.06	pg/L	1613B
	Total HpCDF	50	4.61	pg/L	1613B
	Total HxCDD	50	5.34	pg/L	1613B
	Total HxCDF	50	8.74	pg/L	1613B
	Total PeCDD	50	2.29	pg/L	1613B
	Total PeCDF	50	2.58	pg/L	1613B
	Total TCDD	10	2.20	pg/L	1613B
	Total TCDF	10	2.01	pg/L	1613B

NOTE: RL is Reporting Limit
MDL is Method Detection Limit
GC/MS is Gas Chromatography—Mass Spectrometry
GC/ECD is Gas Chromatography—Electron Capture Detector

III.e. Spatial and Temporal Scale

Sampling sites are located along the Sacramento and San Joaquin River upstream and downstream of the agricultural drain inflows and in the major agricultural drains. The study will be conducted on June 25, 2014 (Sacramento River Basin sites) and June 30, 2014 (San Joaquin River Basin sites)—a production period for irrigated agriculture.

III.f. Data Management

All data from this study will be managed in accordance with the California Environmental Data Exchange Network (CEDEN) templates provided by the Central Valley Regional Data Center. The Central Valley Water Board will load field sheet, field parameters, flow, and chemical parameters data into the templates provided from the Regional Data Center. The time period to enter all data from this study into the templates will be determined when more resources become available.

When the data is entered into the CEDEN Database, the data can then be accessed by the public through the CEDEN website. Information on CEDEN is available at www.ceden.org.

IV. REVIEW STRATEGY

This document will be reviewed by SWAMP, ILRP and CV-SALTS program staff from the Central Valley Water Board. The final study report will be provided for review to the same Central Valley Water Board programs and the stakeholder committee that has been providing input on a project evaluating appropriate beneficial use designations in agricultural dominated water bodies.

V. QUALITY ASSURANCE

All aspects of this study, including all samples and field measurements collected, will be conducted in accordance with the 2008 SWAMP Quality Assurance Program Plan (QAPrP) for the State of California's Surface Water Ambient Monitoring Program (State Water Board, 2008) and the Procedures Manual for the San Joaquin River Water Quality Monitoring Program (Central Valley Water Board, 2010).

Blind field replicates will be collected at one site for each of the separate runs, to meet SWAMP's 10% frequency specification. Sample bottles will be provided by Excelchem Environmental Labs. Water samples will be bottled appropriately based on whether they come pre-preserved or need to be held at <10°C. Travel and laboratory blanks will be used for each batch of bottles collected and processed. Chain-of-custody documentation will be maintained for all samples.

V.a. Field Equipment

A YSI multiparameter water quality monitor will be used to collect data for temperature, dissolved oxygen, pH and specific conductivity. Turbidity measurements will be collected with a Hach turbidimeter. The field equipment is calibrated using certified calibration standards and manufacturer specifications prior to each sampling event and the calibration is checked for accuracy following each sampling event. Calibration records are maintained at the Central Valley Water Board offices and are used to determine instrument accuracy. A digital camera will be used to take sampling site photos. Specific model numbers and calibration dates for the field equipment will be noted on the field sheets and in the final report.

V.b. Laboratory Methods and Costs

Most lab analyses will be conducted by Excelchem Environmental Labs in Rocklin, CA. The *E. coli* samples will be processed by qualified staff members at the Central Valley Regional Water Quality Control Board.

Sampling cost estimates are outlined in Table 3 and include submittal of four QA/QC samples.

Table 16 Laboratory Cost for Key Constituents and All Scans

Analysis	Test Method	Cost
Polychlorinated Biphenyls (PCB's)	8082A	$ 60.00
GC/MS Semivolatiles	8270C	$ 75.00
Volatile Organic Compound & Oxygenated Additive	8260B	$ 125.00
Poly-Chlorinated-Dibenzo-p-Dioxin/Furan HRMS	1613B	$ 500.00
Drinking Water Volatile Organic Compounds	524.2	$ 80.00
Organo-Chlorinated Pesticide	8081A	$ 60.00
Organo-Phosphorus Pesticide	8141A	$ 60.00
Chlorinated Herbicide	8151A	$ 60.00
1,2-DB-3-CP; 1,2-DCEthene; 1,2,3-TCPPane	8260B	$ 40.00
Perchlorate	314.1	$ 50.00
Aluminum	200.7/200.8	$ 15.00
Barium	200.7/200.8	$ 4.00
Boron	200.7/200.8	$ 15.00
Iron	200.7/200.8	$ 15.00
Thallium	200.7/200.8	$ 4.00
Antimony, Beryllium, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, Silver, Titanium, Zinc, Arsenic, Thorium, Chromium 4	200.8 ICP/MS	$ 80.00
Fluoride Salts	300	$ 5.00
Ammonia Nitrogen	4500-NH3	$ 30.00
Nitrate Nitrogen	300	$ 30.00
Nitrite Nitrogen	300	$ 10.00
Title 22 General Minerals: Alkalinity, Calcium, Chloride, Copper, Iron, Methylene Blue Active Substances (MBAs), Manganese, Magnesium, pH, Sodium, Sulfate, Total Dissolved Solids (TDS), Total Hardness, Total Conductivity, Zinc		$ 105.00
Aluminum (dissolved)	200.7	$ 15.00
Arsenic (dissolved)	200.7	$ 20.00
Lead (dissolved)	200.7	$ 15.00
Iron (dissolved)	200.7	$ 15.00
Dissolved filtering fee $20/hour/sample (4 dissolved metals)		$ 80.00
	Total per Site:	$ 1,568.00
	Total for 11 Sites	$ 17,248.00
DI water $10.00/gallon (6 gallons)		$ 60.00
	QA Samples per Study Area	$ 3,261.00
	Total QA Samples for all Study Areas	$ 6,522.00
Level III QA/QC package $10/hour (15 total samples)		$ 150.00
Grand Total for Key Constituents and All Scans (11 sites + QA)		**$ 23,770.00**

Table 17 Estimated Analytical Cost by Study Area

Study Area	# Sites	# QA Samples	Cost
Sacramento River	4	2	$9,498.00
San Joaquin River	7	2	$14,232.00
Total:	11	4	**$23,730.00**

VI. REFERENCES

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APPENDIX A: List of potential parameters of concern including MCLs and CTRs

The following list all of the constituents that have MUN water quality evaluation criteria. Please note that not all of these constituents were tested for due to scan variations provided by each laboratory.

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
1,1,1-Trichloroethane	0.200 mg/L			1.0 mg/L [California Public Health Goal for Drinking Water]
1,1,2,2-Tetrachloroethane	0.001 mg/L		0.00017 mg/L	0.0001 mg/L [California Public Health Goal for Drinking Water]
1,1,2,Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2 mg/L			4.0 mg/L [California Public Health Goal for Drinking Water]
1,1,2-Trichloroethane	0.005 mg/L		0.0006 mg/L	0.0003 mg/L [California Public Health Goal for Drinking Water]
1,1-Dichloroethane	0.005 mg/L			0.003 mg/L [California Public Health Goal for Drinking Water]
1,1-Dichloroethylene	0.006 mg/L		0.000057 mg/L	0.010 mg/L [California Public Health Goal for Drinking Water]
1,2,4-Trichlorobenzene	0.005 mg/L			0.005 mg/L [California Public Health Goal for Drinking Water]
1,2,4-Trimethylbenzene				0.330 mg/L [California DPH Notification Level for drinking water]
1,2-Dibromo-3chloropropane	0.0002 mg/L			0.0000017 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
(DBCP)				
1,2-Dibromoethane (Ethylene Dibromide) (EDB)	0.00005 mg/L			0.00001 [California Public Health Goal for Drinking Water]
1,2-Dichlorobenzene	0.6 mg/L		2.7 mg/L	0.6 mg/L [California Public Health Goal for Drinking Water]
1,2-Dichloroethane (Ethylene dichloride)	0.0005 mg/L		0.00038 mg/L	0.0004 mg/L [California Public Health Goal for Drinking Water]
1,2-Dichloropropane	0.005 mg/L		0.00052 mg/L	0.00050 mg/L [California Public Health Goal for Drinking Water]
1,2-Diphenylhydrazine			0.000040 mg/L	
1,3 Dichlorobenzene			0.400 mg/L	0.600 mg/L [California DPH Notification Level for drinking water]
1,3,5-Trimethylbenzene				0.330 [California DPH Notification Level for drinking water]
1,3-Dichloropropene	0.0005 mg/L		0.01 mg/L	0.0002 mg/L [California Public Health Goal for Drinking Water]
1,4-Dichlorobenzene	0.005 mg/L		0.400 mg/L	0.006 mg/L [California Public Health Goal for Drinking Water]
2,3,7,8-TCDD (Dioxin)	3 x 10-8 mg/L		1.3 x 10-11 mg/L	5 x 10-11 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
2,4,5-TP (Silvex)	0.05 mg/L			0.002 mg/L [California Public Health Goal for Drinking Water]
2,4,6-Trichlorophenol			0.0021 mg/L	
2,4-Dichlorophenol			0.093 mg/L	
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07 mg/L			0.02 mg/L [California Public Health Goal for Drinking Water]
2,4-Dichlorophenoxybutyric acid (2,4-DB)				0.056 mg/L [USEPA IRIS Reference Dose]
2,4-Dimethylphenol			0.540 mg/L	
2,4-Dinitrophenol			0.070 mg/L	
2,4-Dinitrotoluene			0.00011 mg/L	
2-Chloronaphthalene			1.7 mg/L	
2-Chlorophenol			0.120 mg/L	
2-Methyl-4,6-Dinitrophenol			0.0134 mg/L	
3,3'-Dichlorobenzidine			0.00004 mg/L	

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
4,4'-DDD			0.00000083 mg/L	0.00015 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
4,4'-DDE			0.00000059 mg/L	0.0001 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
4,4'-DDT			0.00000059 mg/L	0.0001 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Acenaphthene			1.2 mg/L	0.020 mg/L [USEPA National Recomm. WQ Criteria, taste & odor
Acrolein			0.320 mg/L	0.110 mg/L [Odor threshold (Amoore and Hautala)]
Acrylonitrile			0.000059 mg/L	
Alachlor	0.002 mg/L			0.004 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Aldrin			0.00000013 mg/L	0.0000021 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Alpha-BHC (alpha-Benzene hexachloride)			0.0000039 mg/L	0.000013 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Aluminum	1.0 mg/L	0.2 mg/L		0.600 mg/L [California Public Health Goal for Drinking Water]
Ammonia				1.5 mg/L [Odor threshold (Amoore and Hautala)]
Anthracene			9.6 mg/L	
Antimony	0.006 mg/L		.0014 mg/L	0.020 mg/L [California Public Health Goal for Drinking Water]
Arsenic	0.010 mg/L			0.000004 mg/L [California Public Health Goal for Drinking Water]
Asbestos	7 Million Fibers per Liter		7 Million Fibers/Liter	
Atrazine	0.001 mg/L			0.00015 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Barium	1.0 mg/L			2.0 mg/L [California Public Goal for Drinking Water]
Bentazon	0.018 mg/L			
Benzene	0.001 mg/L		0.0012 mg/L	0.00015 mg/L [California Public Health Goal for Drinking Water]
Benzidine			0.00000012 mg/L	
Benzo(a)Anthracene [1,2-Benzanthracene]			0.0000044 mg/L	0.000029mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Benzo(a)pyrene	0.0002 mg/L		0.0000044 mg/L	0.000007mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Benzo(b)Fluoranthene [3,4-Benzofluoranthene]			0.0000044 mg/L	0.000029mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Benzo(k)Fluoranthene			0.0000044 mg/L	0.000029mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Beryllium	0.004 mg/L			0.001 mg/L [California Public Health Goal for Drinking Water]
Beta/photon emitters	4 millirem/year annual dose equivalent to the total body or any internal organ			
Beta-BHC (beta-Benzene hexachloride)			0.000014 mg/L	0.000023 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Bis(2-Chloroethyl)Ether			0.000031 mg/L	
Bis(2-Chloroisopropyl)Ether			1.400 mg/L	
Boron				1 mg/L [California Public Health Goal for Drinking Water]
Bromoform			0.0043 mg/L	0.004 mg/L USEPA IRIS Cancer Risk Level

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Butylbenzyl Phthalate			3.0 mg/L	
Cadmium	0.005 mg/L			0.00004 mg/L [California Public Health Goal for Drinking Water]
Carbofuran	0.04 mg/L			
Carbon Tetrachloride	0.0005 mg/L			0.00025 mg/L [National Toxics Rule (NTR) for sources of drinking water]
Chlordane	0.0001 mg/L		0.00000057 mg/L	0.00003 mg/L [California Public Health Goal for Drinking Water]
Chloride		250 mg/L		
Chlorobenzene	0.070 mg/L		0.680 mg/L	
Chlorodibromomethane			0.00041 mg/L	
Chloroform				0.0018 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption]
Chlorpyrifos				0.002 mg/L [USEPA, OPP Drinking Water Health Advisory - non-cancer]
Chromium	0.05 mg/L			

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Chrysene			0.0000044 mg/L	0.00029 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Cis1,2-Dichloroethylene	0.006 mg/L			0.100 mg/L [California Public Health Goal for Drinking Water]
Color		15 Units		
Copper		1.0 mg/L	1.3 mg/L	0.300 mg/L [California Public Health Goal for Drinking Water]
Cyanide	0.15 mg/L		0.700 mg/L	0.150 mg/L [California Public Health Goal for Drinking Water]
Dalapon	0.2 mg/L			0.790 mg/L [California Public Health Goal for Drinking Water]
Di(2-ethylhexyl)adipate	0.4 mg/L			
Di(2-ethylhexyl)phthalate (DEHP) (Bis(2-ethylhexyl) phthalate)	0.004 mg/L			0.0018 mg/L [National Toxics Rule (NTR) for sources of drinking water]
Diazinon				0.0012 mg/L [CDPH Notification Level for drinking water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Dibenzo(ah)Anthracen e			0.0000044 mg/L	0.0000085 [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Dichlorobromomethane			0.00056 mg/L	0.00027 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Dichloromethane (Methylene Chloride)	0.005 mg/L		0.0047 mg/L	0.0004 mg/L [California Public Health Goal for Drinking Water]
Dieldrin			0.00000014 mg/L	0.0000022 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Diethyl Phthalate			23 mg/L	
Di-isopropyl ether (Isopropyl ether) (DIPE)				0.0008 mg/L [Odor threshold (Amoore and Hautala)]
Dimethyl Phthalate			313 mg/L	
Di-n-Butyl Phthalate			2.7 mg/L	
Dinoseb	0.007 mg/L			0.014 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Diquat	0.02 mg/L			
E. coli				235 MPN/100 mL [USEPA Recreational Guideline for Designated Beach Area (Upper 75% confidence level)]
Endosulfan I (Alpha-Endosulfan)			0.110 mg/L	0.042 mg/L [USEPA IRIS Reference Dose]
Endosulfan II (Beta-Endosulfan)			0.110 mg/L	0.042 mg/L [USEPA IRIS Reference Dose]
Endosulfan Sulfate	0.002 mg/L		0.110 mg/L	
Endothall	0.1 mg/L			
Endrin	0.002 mg/L		0.00076 mg/L	0.0018 mg/L [California Public Health Goal for Drinking Water]
Endrin Aldehyde			0.00076 mg/L	
Ethylbenzene	0.3 mg/L		3.1 mg/L	0.0032 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Fluoranthene			0.3 mg/L	0.280 mg/L [USEPA IRIS Reference Dose]
Fluorene			1.3 mg/L	0.280 mg/L [USEPA IRIS Reference Dose]
Fluoride		2.0 mg/L		1.0 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Foaming Agents (MBAS)		0.5 mg/L		
Gamma-BHC (gamma-Benzene hexachloride) (Lindane)	0.0002 mg/L		0.000019 mg/L	0.000032 mg/L [California Public Health Goal for Drinking Water)
Glyphosate	0.7 mg/L			
Gross Alpha particle activity (excluding radon and uranium)	15 pCi/L			
Heptachlor	0.0004 mg/L		0.00000021 mg/L	0.000008 mg/L [California Public Health Goal for Drinking Water]
Heptachlor Epoxide	0.0002 mg/L		0.00000010 mg/L	
Hexachlorobenzene	0.001 mg/L		0.00000075 mg/L	
Hexachlorobutadiene			0.00044 mg/L	
Hexachlorocyclopentadiene	0.05 mg/L		0.240 mg/L	
Hexachloroethane			0.0019 mg/L	

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Indeno(1,2,3-cd) Pyrene			0.0000044 mg/L	0.000029 mg/L [Cal/EPA Cancer Potency Factor as a drinking water level (assume 70kg body weight & 2 liters per day drinking water consumption)]
Iron		0.3 mg/L		
Isophorone			0.0084 mg/L	
Lead	0.015 mg/L			0.0002 mg/L California Public Health Goal for Drinking Water]
Manganese		0.05 mg/L		0.500 mg/L [California DPH Notification Level for drinking water]
Mercury	0.002 mg/L		0.000050 mg/L	0.0012 mg/L [California Public Health Goal for Drinking Water]
Methoxychlor	0.03 mg/L			0.00009 mg/L [California Public Health Goal for Drinking Water]
Methyl Bromide (Bromomethane)			0.048 mg/L	
Methyl-tert-butyl ether (MTBE)	0.013 mg/L	0.005 mg/L		0.013 mg/L [California Public Health Goal for Drinking Water]
Molinate	0.02 mg/L			
Monochlorobenzene	0.1 mg/L			

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Nickel	0.100 mg/L		0.61 mg/L	0.012 mg/L [California Public Health Goal for Drinking Water]
Nickel	0.1 mg/L		0.610 mg/L	0.012 mg/L [California Public Health Goal for Drinking Water]
Nitrate (as NO3)	45 mg/L			
Nitrate+Nitrite (sum as nitrogen)	10 mg/L			
Nitrite (as Nitrogen)	1.0 mg/L			
Nitrobenzene			0.017 mg/L	
N-Nitrosodimethylamine (NDMA)			0.00000069 mg/L	0.000003 mg/L [California Public Health Goal for Drinking Water]
N-Nitrosodi-n-Propylamine			0.000005 mg/L	
N-Nitrosodiphenylamine			0.005 mg/L	
Odor		3 TON (Threshold Odor Number)		
Oxamyl	0.2 mg/L			
Pentachlorophenol	0.001 mg/L		0.00028 mg/L	0.0003 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Perchlorate	0.006 mg/L			0.006 mg/L [California Public Health Goal for Drinking Water]
pH		6.5 - 8.5		
Phenol			21.0 mg/L	
Picloram	0.5 mg/L			
Polychlorinated Biphenyls (PCBs)	0.0005 mg/L		0.00000017 mg/L	0.00009 mg/L California Public Health Goal for Drinking Water]
Pyrene			0.960 mg/L	0.210 mg/L [USEPA IRIS Reference Dose]
Radium-226	5 pCi/L (combined radium-226 & -228)			
Radium-228	5 pCi/L (combined radium-226 & -228)			
Selenium	0.05 mg/L			0.03 mg/L [California Public Health Goal for Drinking Water]
Silver		0.1 mg/L		0.035 mg/L [USEPA IRIS Reference Dose]
Simazine	0.004 mg/L			

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Sodium				20 mg/L [USEPA Drinking Water Advisory (for persons on restricted sodium diet)]
Specific Conductance		900 µS/cm		
Strontium-90	8 pCi/L (=4 millirem/yr. dose to bone marrow)			
Styrene	0.1 mg/L			
Sulfate		250 mg/L		
Tetrachloroethylene (Tetrachloroethene) (PCE)	0.005 mg/L		0.0008 mg/L	0.0006 mg/L [California Public Health Goal for Drinking Water]
Thallium	0.002 mg/L		0.0017 mg/L	0.0001 mg/L [California Public Health Goal for Drinking Water]
Thiobencarb	0.07 mg/L	0.001 mg/L		
Toluene	0.15 mg/L		6.800 mg/L	0.150 [California Public Health Goal for Drinking Water]
Total Dissolved Solids		500 mg/L		
Total Triahlomethanes	0.080 mg/L			
Toxaphene	0.003 mg/L		0.00000073 mg/L	0.00003 mg/L [California Public Health Goal for Drinking Water]

Analyte	Primary MCL	Secondary MCL	CTR	Other Evaluation Criteria/Guidelines
Trans-1,2-Dichloroethylene	0.01 mg/L		0.700 mg/L	0.00060 mg/L [California Public Health Goal for Drinking Water]
Trichloroethylene (TCE)	0.005 mg/L		0.0027 mg/L	0.0017 mg/L [California Public Health Goal for Drinking Water]
Trichlorofluoromethane (Freon 11)	0.15 mg/L			1.3 mg/L [California Public Health Goal for Drinking Water]
Tritium	20000 pCi/L (=4 millirem/yr. dose to total body)			
Turbidity		5 NTU		
Uranium	20 pCi/L			
Vanadium				0.050 mg/L [California DPH Notification Level for drinking water]
Vinyl Chloride	0.0005 mg/L		0.002 mg/L	0.00005 mg/L [California Public Health Goal for Drinking Water]
Xylenes	1.750 mg/L			1.80 mg/L [California Public Health Goal for Drinking Water]
Zinc		5.0 mg/L		2.1 mg/L [USEPA IRIS Reference Dose]

Appendix 4. Sampling Event Preparation

Sample Bottle Labeling

All samples will be pre-labeled before each sampling event to the extent practicable. Sample id numbers will correspond with the field sheets. Pre-labeling sample bottles simplifies field activities. Custom labels will be produced using blank water-proof labels. Using this approach will allow the stations and analytical constituent information to be entered into the computer program in advance, and printed as needed prior to each sampling event.

Labels shall be placed on the appropriate bottles in a dry environment; attempting to apply labels to sample bottles after filling will cause problems, as labels usually do not adhere to wet bottles. The labels shall be applied to the bottles rather than to the caps. Field labels shall contain the following information:

Sampler initials, year, month, date – sample id, parameter identification.

Parameter identifications are as follows:

M	Metals
VOC	Volatile Organic Compounds
N_n	Nitrate as Nitrogen and Nitrite as Nitrogen
MBA	Methylene Blue Active Substances

Example:

CLG090505-10M
CLG090505-10VOC
CLG090505-10N_n
CLG090505-10MBA

Appendix 5. Field of Protocols

Field crews (2 persons per crew, minimum) will only be mobilized for sampling when weather conditions and flow conditions are considered to be safe. For safety reasons, sampling will occur during daylight hours. A sampling event should proceed in the following manner:

1. Before leaving the sampling crew base of operations, notify laboratory, confirm number and type of sample bottles as well as the complete equipment list.
2. Proceed to the first sampling station.
3. Fill-out the general information on the field log sheets (Appendices 6&7).
4. Take field measurements and observations, and record on the field log sheet (Appendix 7).
5. Take the samples indicated on the field log sheet in the manner described in this plan. Place bottles in the coolers with ice. Double check against the log sheet that all appropriate bottles were filled.
6. Repeat the procedures in steps 3, 4, and 5 for each of the remaining sampling stations.
7. Complete the chain of custody forms (Appendix 8) using the field notes.
8. After collection is completed, deliver the samples to Excelchem environmental labs at the end of the field run on June 25th.

Appendix 6. Sample Collection

Water Sample Collection

All water samples will be collected as grab samples, using aseptic technique. At most stations, grab samples will be collected at approximately six feet from the bank, using sampling poles, by direct submersion of the sample bottle depth. This is the preferred method for grab sample collection; however, due to sampling station configurations and safety concerns, direct filling of sample bottles is not always feasible. Sampling station configuration will dictate grab sample collection technique. Grab samples will be collected directly into the appropriate bottles (containing the required preservations). The grab sample technique that may be employed is described below.

Direct Submersion:

Where practical, all grab samples will be collected by direct submersion to mid-stream, mid-depth using the following procedures.

The collector will be careful to not touch the inside of the sample bottle at any time. If the inside of the sample bottle is accidentally touched another sample bottle will be used. This is the preferred method for grab sample collection, and shall be adhered to as long as the safety of the sampling personnel is not jeopardized by doing so. Modifications are to be made only as necessary, and clean sampling techniques are always to be followed. After collection the samples will be immediately placed on ice in a cooler for transport to the analytical laboratories. All samples will be delivered to Excelchem environmental labs at the end of the field run (June 25th only). Control samples will be collected at the same time and also immediately placed on ice. The proper COC form (See Appendix 8) will be filled out and signed by the appropriate lab personnel prior to releasing the samples to them.

Clean Sampling Techniques

Samples will be collected using “clean sampling techniques” to minimize the possibility of sample contamination. For this program, clean techniques must be employed whenever handling bottles, lids, or intermediate containers. Clean sampling techniques are summarized below:

- Samples are collected only into new, clean, laboratory provided sample bottles.
- Wearing clean powder-free nitrile gloves at all times are required on sampling crews.
- Clean, powder-free nitrile gloves are changed whenever something not known to be clean has been touched.

- Clean techniques must be employed whenever handling grab sample or intermediate bottles.
- To reduce the potential for contamination, sample collection personnel must adhere to the following rules while collecting samples:
  - No smoking.
  - Never sample near a running vehicle. Do not park vehicles in immediate sample collection area, even non-running vehicles.
  - During wet weather events avoid allowing rainwater to drip from rain gear or any other surface into sample bottles.
  - Do not eat or drink during sample collection.
  - Do not breathe, sneeze or cough in the direction of an open sample bottle.
- Wear clean powder-free nitrile gloves when handling bottles and caps. Change gloves if soiled or if the potential for cross-contamination occurs from handling sampling materials or samples;
- Submerge bottle to mid-stream/mid-depth, remove lid, let bottle fill, and replace lid. Place sample on ice;
- Collect remaining samples including control samples, if needed, using the same protocols described above;
- Fill out COC form, note sample collection on field form, and deliver to analytical lab.

Field Measurements and Observations

Field measurements will be taken and observations made at each sampling station before a sample is collected. Field measurements will include pH, temperature, dissolved oxygen, specific conductance and turbidity. Field measurements will be taken at approximately six feet from the bank. All field measurement results and comments on field observations will be recorded in the field log in Appendices 6&7.

If at any time the collection of field measurements appears unsafe, an alternate site within 100 yards may be used, or the sample will not be collected. Sample site conditions will be noted on the field sheets, and photos will be taken of the site.

In addition to field measurements, observations will be made at each sampling station. Observations will include color, odor, floating materials, presence of wildlife, as well as observations of contact and non-contact recreation. All comments on field observations will be recorded in the field log presented in Appendices 6&7.

Chain-of-Custody

Chain-of-custody (COC) forms will be filled out for all samples submitted to the analytical laboratory. Sample data, sample location, sample collection crew names, and analysis requested shall be noted on each COC. See Appendix 8 for blank COC forms.

Transport to Lab

Samples will be stored in coolers with ice and delivered to ExcelChem for the June 25th, 2014 samples, and picked up by Excelchem for the June 30th, 2014 samples.

Appendix 7. List of Constituents within Each Scan including RLs and MDLs

Scan	Analyte	RL	MDL	Unit	Test Method
Volatile Organic Compounds (VOCs) by GC/MS	1, 1-Dichloroethane	0.5	0.04	µg/L	EPA 8260B
	1,1,1,2-Tetrachloroethane	0.5	0.08	µg/L	EPA 8260B
	1,1,1-Trichloroethane	0.5	0.05	µg/L	EPA 8260B
	1,1,2,2-Tetrachloroethane	0.5	0.4	µg/L	EPA 8260B
	1,1,2-Trichloroethane	0.5	0.1	µg/L	EPA 8260B
	1,1-Dichloroethane	0.5	0.05	µg/L	EPA 8260B
	1,1-Dichloropropene	0.5	0.03	µg/L	EPA 8260B
	1,2,3-Trichlorobenzene	0.5	0.05	µg/L	EPA 8260B
	1,2,3-Trichloropropane	0.5	0.06	µg/L	EPA 8260B
	1,2,4-Trichlorobenzene	0.5	0.02	µg/L	EPA 8260B
	1,2,4-Trimethylbenzene	0.5	0.04	µg/L	EPA 8260B
	1,2-Dibromo-3-chloropropane	0.5	0.07	µg/L	EPA 8260B
	1,2-Dibromoethane (EDB)	0.5	0.1	µg/L	EPA 8260B
	1,2-Dichlorobenzene	0.5	0.06	µg/L	EPA 8260B
	1,2-Dichloroethane	0.5	0.04	µg/L	EPA 8260B
	1,2-Dichloropropane	0.5	0.06	µg/L	EPA 8260B
	1,3-Dichlorobenzene	0.5	0.03	µg/L	EPA 8260B
	1,3-Dichloropropane	0.5	0.06	µg/L	EPA 8260B
	1,4-Dichlorobenzene	0.5	0.05	µg/L	EPA 8260B
	2-Butanone	5.0	0.1	µg/L	EPA 8260B
	2-Chlorotoluene	0.5	0.03	µg/L	EPA 8260B
	2-Hexanone	5.0	0.1	µg/L	EPA 8260B
	4-Chlorotoluene	0.5	0.05	µg/L	EPA 8260B
	4-Isopropyltoluene	0.5	0.04	µg/L	EPA 8260B
	4-Methyl1-2pentanone	5.0	0.05	µg/L	EPA 8260B
	Acetone	5.0	0.1	µg/L	EPA 8260B
	Benzene	0.5	0.03	µg/L	EPA 8260B
	Bromobenzene	0.5	0.05	µg/L	EPA 8260B
	Bromochloromethane	0.5	0.07	µg/L	EPA 8260B
	Bromodichloromethane	0.5	0.05	µg/L	EPA 8260B
	Bromoform	0.5	0.03	µg/L	EPA 8260B
	Bromomethane	0.5	0.05	µg/L	EPA 8260B
	Carbon disulfide	0.5	0.06	µg/L	EPA 8260B
	Carbon tetrachloride	0.5	0.02	µg/L	EPA 8260B
	Chlorobenzene	0.5	0.03	µg/L	EPA 8260B
	Chloroethane	0.5	0.08	µg/L	EPA 8260B
	Chloroform	0.5	0.05	µg/L	EPA 8260B
	Chloromethane	0.5	0.06	µg/L	EPA 8260B

Scan	Analyte	RL	MDL	Unit	Test Method
VOCs by GC/MS cont'd	cis-1,2-Dichloroethane	0.5	0.03	µg/L	EPA 8260B
	cis-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 8260B
	Dibromochloromethane	0.5	0.07	µg/L	EPA 8260B
	Dibromomethane	0.5	0.07	µg/L	EPA 8260B
	Dichlorodifluoromethane	0.5	0.07	µg/L	EPA 8260B
	Di-isopropyl ether	0.5	0.1	µg/L	EPA 8260B
	Ethyl tert-Butyl Ether	0.5	0.04	µg/L	EPA 8260B
	Ethylbenzene	0.5	0.03	µg/L	EPA 8260B
	Hexachlorobutadiene	0.5	0.07	µg/L	EPA 8260B
	Iodomethane	0.5	0.03	µg/L	EPA 8260B
	Isopropylbenzene	0.5	0.04	µg/L	EPA 8260B
	m,p-Xylene	1.0	0.09	µg/L	EPA 8260B
	Methyl tert-Butyl Ether	0.5	0.05	µg/L	EPA 8260B
	Methylene chloride	5.0	0.08	µg/L	EPA 8260B
	Naphthalene	0.5	0.04	µg/L	EPA 8260B
	n-Butylbenzene	0.5	0.04	µg/L	EPA 8260B
	n-Propylbenzene	0.5	0.04	µg/L	EPA 8260B
	o-Xylene	0.5	0.04	µg/L	EPA 8260B
	sec-Butylbenzene	0.5	0.03	µg/L	EPA 8260B
	TBA	1.0	0.1	µg/L	EPA 8260B
	Tert-Amyl Methyl Ether	0.5	0.03	µg/L	EPA 8260B
	tert-Butylbenzene	0.5	0.02	µg/L	EPA 8260B
	Tetrachloroethene	0.5	0.08	µg/L	EPA 8260B
	Toluene	0.5	0.04	µg/L	EPA 8260B
	trans-1,2-Dichloroethane	0.5	0.04	µg/L	EPA 8260B
	trans-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 8260B
	Trichloroethane	0.5	0.06	µg/L	EPA 8260B
	Trichlorofluoromethane	0.5	0.05	µg/L	EPA 8260B
	Trichlorotrifluoroethane	1.0	0.05	µg/L	EPA 8260B
	Vinyl chloride	0.5	0.06	µg/L	EPA 8260B
	Xylenes, total	1.0	0.1	µg/L	EPA 8260B
	1,1,1,2-Tetrachloroethane	0.5	0.08	µg/L	EPA 524
	1,1,1-Trichloroethane	0.5	0.05	µg/L	EPA 524
	1,1,2,2-Tetrachloroethane	0.5	0.04	µg/L	EPA 524
	1,1,2-Trichloroethane	0.5	0.1	µg/L	EPA 524
	1,1,-Dichloroethane	0.5	0.04	µg/L	EPA 524
	1,1-Dichloroethane	0.5	0.05	µg/L	EPA 524
	1,1-Dichloropropene	0.5	0.03	µg/L	EPA 524
	1,2,3-Trichlorobenzene	0.5	0.05	µg/L	EPA 524
	1,2,3-Trichloropropane	0.5	0.06	µg/L	EPA 524

Scan	Analyte	RL	MDL	Unit	Test Method
VOCs by GC/MS cont'd	1,2,4-Trichlorobenzene	0.5	0.02	µg/L	EPA 524
	1,2,4-Trimethylbenzene	0.5	0.04	µg/L	EPA 524
	1,2-Dibromo-3-chloropropane	0.5	0.07	µg/L	EPA 524
	1,2-Dibromoethane (EDB)	0.5	0.1	µg/L	EPA 524
	1,2-Dichlorobenzene	0.5	0.06	µg/L	EPA 524
	1,2-Dichloroethane	0.5	0.06	µg/L	EPA 524
	1,2-Dichloropropane	0.5	0.06	µg/L	EPA 524
	1,3,5-Trimethylbenzene	0.5	0.03	µg/L	EPA 524
	1,3-Dichlorobenzene	0.5	0.03	µg/L	EPA 524
	1,3-Dichloropropane	0.5	0.06	µg/L	EPA 524
	1,4-Dichlorobenzene	0.5	0.05	µg/L	EPA 524
	2,2-Dichloropropane	0.5	0.06	µg/L	EPA 524
	2-Butanone	5.0	0.1	µg/L	EPA 524
	2-Chlorotoluene	0.5	0.03	µg/L	EPA 524
	2-Hexanone	0.5	0.1	µg/L	EPA 524
	4-Chlorotoluene	0.5	0.05	µg/L	EPA 524
	4-Isopropyltoluene	0.5	0.04	µg/L	EPA 524
	4-Methyl-2-pentanone	0.5	0.05	µg/L	EPA 524
	Acetone	5.0	0.1	µg/L	EPA 524
	Benzene	0.5	0.03	µg/L	EPA 524
	Bromobenzene	0.5	0.05	µg/L	EPA 524
	Bromochloromethane	0.5	0.07	µg/L	EPA 524
	Bromodichloromethane	0.5	0.05	µg/L	EPA 524
	Bromoform	0.5	0.03	µg/L	EPA 524
	Bromomethane	0.5	0.05	µg/L	EPA 524
	Carbon disulfide	0.5	0.06	µg/L	EPA 524
	Carbon tetrachloride	0.5	0.02	µg/L	EPA 524
	Chlorobenzene	0.5	0.03	µg/L	EPA 524
	Chloroethane	0.5	0.08	µg/L	EPA 524
	Chloroform	0.5	0.05	µg/L	EPA 524
	Chloromethane	0.5	0.06	µg/L	EPA 524
	cis-1,2-Dichloroethane	0.5	0.03	µg/L	EPA 524
	cis-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 524
	Dibromochloromethane	0.5	0.07	µg/L	EPA 524
	Dibromomethane	0.5	0.07	µg/L	EPA 524
	Dichlorodifluoromethane	0.5	0.07	µg/L	EPA 524
	Di-isopropyl ether	0.5	0.1	µg/L	EPA 524
	Ethyl tert-Butyl Ether	0.5	0.04	µg/L	EPA 524
	Ethylbenzene	0.5	0.03	µg/L	EPA 524
	Hexachlorobutadiene	0.5	0.07	µg/L	EPA 524

Scan	Analyte	RL	MDL	Unit	Test Method
VOCs by GC/MS cont'd	Iodomethane	0.5	0.03	µg/L	EPA 524
	Isopropylbenzene	0.5	0.04	µg/L	EPA 524
	m,p-Xylene	0.5	0.09	µg/L	EPA 524
	Methyl tert-Butyl Ether	0.5	0.05	µg/L	EPA 524
	Methylene chloride	1.0	0.08	µg/L	EPA 524
	Naphthalene	0.5	0.04	µg/L	EPA 524
	n-Butylbenzene	0.5	0.04	µg/L	EPA 524
	n-Propylbenzene	0.5	0.04	µg/L	EPA 524
	o-Xylene	0.5	0.04	µg/L	EPA 524
	sec-Butylbenzene	0.5	0.03	µg/L	EPA 524
	Styrene	0.5	0.09	µg/L	EPA 524
	TBA	1.0	0.1	µg/L	EPA 524
	Tert-Amyl Methyl Ether	0.5	0.03	µg/L	EPA 524
	tert-Butylbenzene	0.5	0.02	µg/L	EPA 524
	Tetrachloroethene	0.5	0.08	µg/L	EPA 524
	Toluene	0.5	0.04	µg/L	EPA 524
	Total Trihalomethanes	0.5	0.5	µg/L	EPA 524
	trans-1,2-Dichloroethane	0.5	0.04	µg/L	EPA 524
	trans-1,3-Dichloropropene	0.5	0.04	µg/L	EPA 524
	Trichloroethane	0.5	0.06	µg/L	EPA 524
	Trichlorofluoromethane	0.5	0.05	µg/L	EPA 524
	Trichlorotrifluoroethane	1.0	0.05	µg/L	EPA 524
	Vinyl chloride	0.5	0.06	µg/L	EPA 524
	Xylenes, total	1.0	0.1	µg/L	EPA 524
Pesticides by GC/ECD	4,4'-DDD	0.1	0.006	µg/L	EPA 8081A
	4,4'-DDE	0.1	0.005	µg/L	EPA 8081A
	4,4'-DDT	0.1	0.004	µg/L	EPA 8081A
	Aldrin	0.1	0.011	µg/L	EPA 8081A
	alpha-BHC	0.1	0.011	µg/L	EPA 8081A
	alpha-Chlordane	0.1	0.006	µg/L	EPA 8081A
	beta-BHC	0.1	0.011	µg/L	EPA 8081A
	delta-BHC	0.1	0.021	µg/L	EPA 8081A
	Dieldrin	0.1	0.006	µg/L	EPA 8081A
	Endosulfan I	0.1	0.007	µg/L	EPA 8081A
	Endosulfan II	0.1	0.021	µg/L	EPA 8081A
	Endosulfan sulfate	0.1	0.005	µg/L	EPA 8081A
	Endrin	0.1	0.007	µg/L	EPA 8081A
	Endrin aldehyde	0.1	0.006	µg/L	EPA 8081A
	Endrin Ketone	0.1	0.005	µg/L	EPA 8081A
	gamma-BHC (Lindane)	0.1	0.013	µg/L	EPA 8081A

Scan	Analyte	RL	MDL	Unit	Test Method
Pesticides by GC/ECD cont'd	gamma-Chlordane	0.1	0.005	µg/L	EPA 8081A
	Heptachlor	0.1	0.016	µg/L	EPA 8081A
	Heptachlor epoxide	0.1	0.02	µg/L	EPA 8081A
	Methoxychlor	0.1	0.013	µg/L	EPA 8081A
PCBs by GC/ECD	Aroclor 1016	1.00	0.0600	µg/L	EPA 8081A
	Aroclor 1221	1.00	0.130	µg/L	EPA 8081A
	Aroclor 1232	1.00	0.100	µg/L	EPA 8081A
	Aroclor 1242	1.00	0.0600	µg/L	EPA 8081A
	Aroclor 1248	1.00	0.0600	µg/L	EPA 8081A
	Aroclor 1254	1.00	0.0900	µg/L	EPA 8081A
	Aroclor 1260	1.00	0.0800	µg/L	EPA 8081A
	PCBs	1.00	0.0800	µg/L	EPA 8081A
SemiVolatile Organic Compounds by GC/MS	1,2,4-Trichlorobenzene	2.0	0.6	µg/L	EPA 8270C
	1,4-Dichlorobenzene	2.0	0.4	µg/L	EPA 8270C
	2,4,5-Trichlorophenol	5.0	1.6	µg/L	EPA 8270C
	2,4,6-Trichlorophenol	5.0	1.6	µg/L	EPA 8270C
	2,4-Dichlorophenol	2.0	0.8	µg/L	EPA 8270C
	2,4-Dimethylphenol	2.0	0.8	µg/L	EPA 8270C
	2,4-Dinitrophenol	10.0	0.3	µg/L	EPA 8270C
	2,4-Dinitrotoluene	2.0	0.8	µg/L	EPA 8270C
	2,6-Dinitrotoluene	2.0	0.8	µg/L	EPA 8270C
	2-Chloronaphthalene	2.0	0.2	µg/L	EPA 8270C
	2-Chlorophenol	2.0	0.8	µg/L	EPA 8270C
	2-Methylnaphthalene	2.0	0.6	µg/L	EPA 8270C
	2-Methylphenol	2.0	0.4	µg/L	EPA 8270C
	2-Nitroaniline	2.0	0.4	µg/L	EPA 8270C
	2-Nitrophenol	2.0	1.2	µg/L	EPA 8270C
	3,3´-Dichlorobenzidine	5.0	0.8	µg/L	EPA 8270C
	3-Nitroaniline	2.0	0.5	µg/L	EPA 8270C
	4,6-Dinitro-2-methylphenol	10.0	2.2	µg/L	EPA 8270C
	4-Bromophenyl phenyl ether	2.0	0.8	µg/L	EPA 8270C
	4-Chloro-3-methylphenol	2.0	0.6	µg/L	EPA 8270C
	4-Chloroaniline	2.0	0.5	µg/L	EPA 8270C
	4-Chlorophenyl phenyl ether	2.0	0.5	µg/L	EPA 8270C
	4-Nitroaniline	2.0	0.6	µg/L	EPA 8270C
	4-Nitrophenol	5.0	0.1	µg/L	EPA 8270C
	Acenaphthene	2.0	0.6	µg/L	EPA 8270C
	Acenaphthylene	2.0	0.3	µg/L	EPA 8270C
	Aniline	2.0	0.3	µg/L	EPA 8270C
	Anthracene	2.0	0.3	µg/L	EPA 8270C

Scan	Analyte	RL	MDL	Unit	Test Method
SemiVolatile Organic Compounds by GC/MS	Azobenzene	2.0	0.4	µg/L	EPA 8270C
	Benzidine	5.0	0.2	µg/L	EPA 8270C
	Benzo (a) anthracene	2.0	0.4	µg/L	EPA 8270C
	Benzo (a) pyrene	5.0	1.2	µg/L	EPA 8270C
	Benzo (b) fluoranthene	2.0	0.8	µg/L	EPA 8270C
	Benzo (g,h,i) perylene	2.0	1.3	µg/L	EPA 8270C
	Benzo (k) fluoranthene	2.0	1.0	µg/L	EPA 8270C
	Benzoic acid	30.0	0.5	µg/L	EPA 8270C
	Benzyl alcohol	2.0	0.4	µg/L	EPA 8270C
	Bis(2-chloroethoxy)methane	2.0	0.4	µg/L	EPA 8270C
	Bis(2-chloroethyl)ether	2.0	0.6	µg/L	EPA 8270C
	Bis(2-chloroisopropyl)ether	2.0	0.4	µg/L	EPA 8270C
	Bis(2-ethylhexyl)phthalate	5.0	0.7	µg/L	EPA 8270C
	Butyl benzyl phthalate	2.0	1.0	µg/L	EPA 8270C
	Carbazole	2.0	0.6	µg/L	EPA 8270C
	Chrysene	2.0	0.5	µg/L	EPA 8270C
	Dibenz (a,h) anthracene	2.0	1.6	µg/L	EPA 8270C
	Dibenzofuran	2.0	0.3	µg/L	EPA 8270C
	Diethyl phthalate	2.0	0.6	µg/L	EPA 8270C
	Dimethyl phthalate	2.0	0.8	µg/L	EPA 8270C
	Di-n-butyl phthalate	2.0	0.4	µg/L	EPA 8270C
	Di-n-octyl phthalate	5.0	0.7	µg/L	EPA 8270C
	Fluoranthene	2.0	0.6	µg/L	EPA 8270C
	Fluorene	2.0	0.5	µg/L	EPA 8270C
	Hexachlorobenzene	2.0	0.6	µg/L	EPA 8270C
	Hexachlorobutadiene	2.0	0.6	µg/L	EPA 8270C
	Hexachlorocyclopentadiene	2.0	0.6	µg/L	EPA 8270C
	Hexachloroethane	2.0	0.5	µg/L	EPA 8270C
	Indeno (1,2,3-cd) pyrene	5.0	1.6	µg/L	EPA 8270C
	Isophorone	2.0	0.3	µg/L	EPA 8270C
	Naphthalene	2.0	0.5	µg/L	EPA 8270C
	Nitrobenzene	2.0	0.7	µg/L	EPA 8270C
	N-Nitrosodimethylamine	2.0	0.4	µg/L	EPA 8270C
	N-Nitrosodi-n-propylamine	2.0	0.3	µg/L	EPA 8270C
	N-Nitrosodiphenylamine	2.0	0.6	µg/L	EPA 8270C
	Pentachlorophenol	10.0	2.4	µg/L	EPA 8270C
	Phenanthrene	2.0	0.4	µg/L	EPA 8270C
	Phenol	2.0	0.3	µg/L	EPA 8270C
	Pyrene	2.0	1.0	µg/L	EPA 8270C

Scan	Analyte	RL	MDL	Unit	Test Method
Organophosphorus Pesticides	Azinphos-methyl	0.200	0.0270	µg/L	EPA 8141A
	Bolstar	0.200	0.0860	µg/L	EPA 8141A
	Coumaphos	0.200	0.168	µg/L	EPA 8141A
	Demeton	0.200	0.105	µg/L	EPA 8141A
	Demeton-O	0.200	0.101	µg/L	EPA 8141A
	Demeton-S	0.200	0.105	µg/L	EPA 8141A
	Diazinon	0.250	0.0650	µg/L	EPA 8141A
	Dichlorvos	0.200	0.156	µg/L	EPA 8141A
	Dimethoate	0.200	0.0710	µg/L	EPA 8141A
	Disulfoton	0.200	0.0690	µg/L	EPA 8141A
	Dursban (Chlorpyrifos)	0.200	0.0710	µg/L	EPA 8141A
	EPN	0.200	0.124	µg/L	EPA 8141A
	Ethoprop	0.200	0.0770	µg/L	EPA 8141A
	Fensulfothion	0.200	0.139	µg/L	EPA 8141A
	Fenthion	0.200	0.0670	µg/L	EPA 8141A
	Gardona (Stirophos)	0.200	0.110	µg/L	EPA 8141A
	Malathion	0.200	0.159	µg/L	EPA 8141A
	Merphos	0.200	0.0970	µg/L	EPA 8141A
	Mevinphos	0.200	0.115	µg/L	EPA 8141A
	Molinate	0.200	0.0440	µg/L	EPA 8141A
	Monocrotophos	0.200	0.0150	µg/L	EPA 8141A
	Naled	0.200	0.169	µg/L	EPA 8141A
	Parathion	0.200	0.0790	µg/L	EPA 8141A
	Parathion-methyl	0.200	0.0770	µg/L	EPA 8141A
	Phorate	0.200	0.0830	µg/L	EPA 8141A
	Ronnel	0.200	0.0660	µg/L	EPA 8141A
	Sulfotep	0.200	0.0950	µg/L	EPA 8141A
	TEPP	0.200	0.151	µg/L	EPA 8141A
	Tokuthion (Prothiofos)	0.200	0.0770	µg/L	EPA 8141A
	Trichloronate	0.200	0.0670	µg/L	EPA 8141A
Chlorinated Herbicides	2,4,5-T	0.500	0.0970	µg/L	EPA 8151A
	2,4,5-TP (Silvex)	0.500	0.0950	µg/L	EPA 8151A
	2,4-D	0.400	0.0860	µg/L	EPA 8151A
	2,4-DB	0.800	0.157	µg/L	EPA 8151A
	3,5-Dichlorobenzoic acid	0.800	0.170	µg/L	EPA 8151A
	4-Nitrophenol	0.600	0.117	µg/L	EPA 8151A
	Acifluorfen	0.800	0.157	µg/L	EPA 8151A
	Bentazon	0.600	0.110	µg/L	EPA 8151A
	Chloramben	0.800	0.00800	µg/L	EPA 8151A
	Dalapon	0.600	0.115	µg/L	EPA 8151A

Scan	Analyte	RL	MDL	Unit	Test Method
Chlorinated Herbicides cont'd	DCPA	0.400	0.0150	µg/L	EPA 8151A
	Dicamba	0.400	0.0800	µg/L	EPA 8151A
	Dichloroprop	0.800	0.196	µg/L	EPA 8151A
	Dinoseb	0.400	0.0830	µg/L	EPA 8151A
	MCPP	10.0	0.891	µg/L	EPA 8151A
	Pentachlorophenol	0.300	0.0530	µg/L	EPA 8151A
	Picloram	0.800	0.0200	µg/L	EPA 8151A
Ion Chromatography	Hexavalent Chromium	1.0	0.1	µg/L	EPA 218.6
	Chloride	0.5	0.04	mg/L	EPA 300.0
	Fluoride	0.1	0.02	mg/L	EPA 300.0
	Nitrate as Nitrogen	0.11	0.009	mg/L	EPA 300.0
	Nitrite as Nitrogen	0.15	0.03	mg/L	EPA 300.0
	Sulfate as SO4	5.0	0.7	mg/L	EPA 300.0
	Perchlorate	2.00	0.0940	µg/L	EPA 314.0
Wet Chemistry	Specific Conductance (EC)	5.00	1.09	µS/cm	EPA 120.1
	Total Dissolved Solids	15.0	7.68	mg/L	SM 2540C
	Cyanide	0.00500	0.000900	mg/L	SM 4500CN E
	pH	0.100	0.100	pH Units	SM 4500-H+ B
	Ammonia as N	0.100	0.0400	mg/L	SM 4500-NH3 B/H
	MBAS	0.100	0.0600	mg/L	SM 5540C
	Total Alkalinity	5.00	2.37	mg/L	SM2320B
	Total Hardness	5.00	2.86	mg/L	SM2340B
Total Recoverable Metals	Aluminum	50.0	24.5	µg/L	EPA 200.7
	Antimony	10.0	1.3	µg/L	EPA 200.7
	Arsenic	10.0	1.0	µg/L	EPA 200.7
	Barium	5.0	1.2	µg/L	EPA 200.7
	Beryllium	5.0	0.09	µg/L	EPA 200.7
	Boron	50.0	0.8	µg/L	EPA 200.7
	Cadmium	5.0	0.1	µg/L	EPA 200.7
	Calcium	100	79.0	µg/L	EPA 200.7
	Chromium	5.0	0.3	µg/L	EPA 200.7
	Copper	5.0	0.8	µg/L	EPA 200.7
	Iron	20.0	11.5	µg/L	EPA 200.7
	Lead	5.0	0.9	µg/L	EPA 200.7
	Magnesium	50.0	15.6	µg/L	EPA 200.7
	Manganese	10.0	0.6	µg/L	EPA 200.7
	Nickel	5.0	0.6	µg/L	EPA 200.7
	Selenium	20.0	1.3	µg/L	EPA 200.7

Scan	Analyte	RL	MDL	Unit	Test Method
Total Recoverable Metals cont'd	Silver	5.0	0.4	µg/L	EPA 200.7
	Sodium	200	120	µg/L	EPA 200.7
	Thallium	20.0	2.2	µg/L	EPA 200.7
	Titanium	50.0	1.2	µg/L	EPA 200.7
	Zinc	10.0	0.3	µg/L	EPA 200.7
Dissolved Metals	Dissolved Aluminum	50.0	24.5	µg/L	EPA 200.7
	Dissolved Arsenic	10.0	1.0	µg/L	EPA 200.7
	Dissolved Iron	20.0	11.5	µg/L	EPA 200.7
	Dissolved Lead	5.0	0.9	µg/L	EPA 200.7
Dixoin/Furan	1,2,3,4,6,7,8-HpCDD	50	2.17	pg/L	1613B
	1,2,3,4,6,7,8-HpCDF	50	3.77	pg/L	1613B
	1,2,3,4,7,8,9-HpCDF	50	4.61	pg/L	1613B
	1,2,3,4,7,8-HxCDD	50	3.98	pg/L	1613B
	1,2,3,4,7,8-HxCDF	50	3.66	pg/L	1613B
	1,2,3,6,7,8-HxCDD	50	5.34	pg/L	1613B
	1,2,3,6,7,8-HxCDF	50	3.97	pg/L	1613B
	1,2,3,7,8,9-HxCDD	50	4.68	pg/L	1613B
	1,2,3,7,8,9-HxCDF	50	8.74	pg/L	1613B
	1,2,3,7,8-PeCDD	50	2.29	pg/L	1613B
	1,2,3,7,8-PeCDF	50	2.58	pg/L	1613B
	2,3,4,6,7,8-HxCDF	50	4.97	pg/L	1613B
	2,3,4,7,8-PeCDF	50	2.36	pg/L	1613B
	2,3,7,8-TCDD	10	2.20	pg/L	1613B
	2,3,7,8-TCDF	10	2.01	pg/L	1613B
	OCDD	100	4.32	pg/L	1613B
	OCDF	100	6.25	pg/L	1613B
	TEQ			pg/L	1613B
	Total HpCDD	50	3.06	pg/L	1613B
	Total HpCDF	50	4.61	pg/L	1613B
	Total HxCDD	50	5.34	pg/L	1613B
	Total HxCDF	50	8.74	pg/L	1613B
	Total PeCDD	50	2.29	pg/L	1613B
	Total PeCDF	50	2.58	pg/L	1613B
	Total TCDD	10	2.20	pg/L	1613B
	Total TCDF	10	2.01	pg/L	1613B

NOTE: RL is Reporting Limit
MDL is Method Detection Limit
GC/MS is Gas Chromatography—Mass Spectrometry
GC/ECD is Gas Chromatography—Electron Capture Detector

Appendix 8. Field Sheets (SWAMP)

SWAMP Field Observations Data Sheet	EventType WQ	Entered in d-base (initial/date)		Page	1	of	1	Pages

SAMPLE COLLECTION

Sample ID	XMP110101-10	Station Description	American R @ Discovery Park				
Personnel:	III/III	Station ID	519AMNDVY				
Sample Time (first sample):		Agency:	Citizens Monitoring Group	Date:	5/2/2011	Funding:	10SW5S01
Purpose:	WaterChem / Habitat / Field Measure	Project:	RB5_StS_05_FY1011	Group:	SJR	Protocol:	AGPRO_R5S_2010

SAMPLE SITE DESCRIPTION

Occupation Method:	Walk-in	Bridge	Other					
Collection Location:	Bank	Midchannel						
Starting Bank (facing downstream):	Left Bank		Right Bank	NA				
Hydromodification Type	None	Bridge	Pipes	ConcreteChannel	GradeControl	Culvert	AerialZiplir	If there is an IMMEDIATE (within range, potentially affecting sample) hydromodification; Is the hydromodification upstream/downstream/within area of sample; if there is no
Hydromodification Location:	UpStream		Down Stream		Within Sample Boundry		NA	Describe existing hydromodifications indicated above, such as a grade control, drainage pipes, bridge, culvert.

GPS

GPS Device:	0	Actual Latitude:	+/- ft	Record Actual GPS coordinates	Target Latitude: 38.60094
Datum:	0	Actual Longitude:			Target Longitude: -121.5055

PHOTOS

1	RB / LB / BB / US / DS / ##
2	RB / LB / BB / US / DS / ##
3	RB / LB / BB / US / DS / ##

HABITAT OBSERVATIONS

Site Odor	None	Sulfides (e.g. rotten eggs)		Sewage	Manure	Petroleum	Smoke	
Sky Code	Clear	Partly Coudy	Overcast	Fog	Smoky	Hazy		
Other Presence	None	Vascular	Nonvascular	OilySheen	Foam	Trash		Record presence of vegetation IN the water at the immediate sampling area. Vascular refers to terrestrial or aquatic vegetation and Nonvascular refers to plankton, periphyton,
Dominant Substrate	Bedrock	Concrete	Cobble	Gravel	Sand	Mud	Unknown	If possible, describe the DOMINANT substrate type; use unknown if you cannot see the dominant substrate type
Water Clarity	Clear (see bottom)		Cloudy (>4" visibility)	Murky (<4" visibility)				This describes the clarity of the water while standing creek side.
Water Odor	None	Sulfides (e.g. rotten eggs)		Sewage	Manure	Petroleum	Mixed	
Water Color	Colorless	Green	Yellow	Brown				The color of the water from standing creek side
Observed Flow	NA	Dry	Isolated Pool	Low	Normal	High	Flood	Visual estimates in cubic feet/second, if able to estimate
Wadability	Yes	No	Unknown					In general, is the waterbody being sampled wadeable to the average person at the point of sample?
Precipitation	None	Fog	Drizzle	Rain	Snow			What is happening right now?
Precipitation/Runoff (last 24 hrs)	None	Light	Moderate/Heavy	Unknown				Record if there is evidence of rain or overland runoff at the site. Light refers to light rain with no overland runoff and Moderate/Heavy refers rain resulting in overland runoff.
Evidence of Fires	No	<1 year	<5 years					

Wind

Direction	N / S / E / W	Record the direction from which the wind is blowing			
Beaufort Scale		Use scale 0-8; refer to the scales listed:		6	Strong Breeze: Large branches in motion; whistling heard in telegraph wires umbrellas used with difficulty
0	Calm; smoke rises vertically	3	Gentle Breeze: Leaves and small twigs in constant motion; wind extends light flag	7	Neargale: Whole trees in motion; inconvenience felt when walking against the wind
1	Light Air: Direction of wind shown by smoke drift, but not by wind vanes	4	Moderate Breeze: Raises dust and loose paper; small branches are moved.	8	Gale: Breaks Twigs and generally impedes progress
2	Light Breeze: Wind felt on face; leaves rustle; ordinary vanes moved by wind	5	Fresh Breeze: Small trees in leaf begin to sway crested wavelets form on inland waters	9	Neargale: Whole trees in motion; inconvenience felt when walking against the wind

FIELD MEASUREMENTS

Measurements Collected:			Subsurface		
Water Temp (°C)	pH	DO (mg/L)	SC (uS/cm)	Turbidity (ntu)	Other:

Don't forget to fill in the calibration sheet

SAMPLES

	Bac 100ml	Crypto 500ml	Giardia 500ml	Sal 100ml	Other:
Number Bottles:	2	0	0	0	

		Sample ID:	Sample Type:
Field Duplicate	Y	XMP110101-20	Grab
Field Blank	N		Individual Bottles Collected By:
Lab Duplicate	N		Pole Hand Pole & beaker

Sample Failure Reason	
No Access	Dry
Flooded	Other (explain)

Light gray cells are for information purposes
Uncolored cells need to be populated

Field Comments:

Appendix 9. Bacterial Processing Lab Sheet (SWAMP)

Run: Colusa Run														
									Sample Processing Date: 6/29/11					
Sample ID Number: ARW110629		40	41	42	43	44	45	52	51	50	60				
Site Code:		520COL006	520COL005	520COL001	520COL002	520COL003	520COL004	FieldBlank	520COL006 LD	520COL002 FD	LAB BLANK			
		18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H
Yellow +	# Large Wells														
	# Small Wells														
	Empty Wells														
	MPN														
		18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H	18H / 22H
Yellow + Fluorescence (+)	# Large Wells														
	# Small Wells														
	False Positives														
	MPN														

Incubator Temperature Checks:							
1st Check ~4 Hrs After Field Crew Leaves:	Initials:	Temp:	Time:	2nd Check - Placed in Incubator:	Initials:	Temp:	Time:
3rd Check ~4 Hrs Before Pull fr Incubator:	Initials:	Temp:	Time:	4th Check - Pulled from Incubator:	Initials:	Temp:	Time:

Media Lot #	FIELD DUPLICATES				LAB DUPLICATES			
	Normal Sample #	43			**Normal Sample #**	**40**		
	Duplicate Sample #	50			**Duplicate Sample #**	**51**		
		MPN	Log MPN	ABS(Normal Log MPN-Dup Log MPN)		MPN	Log MPN	ABS(Normal Log MPN-Dup Log MPN)
TOTAL COLIFORM	*Normal*				*Normal*			
	Duplicate				*Duplicate*			
	Mean of R_{log}	~0.24	Pass	Needs Review	*Mean of R_{log}*	~0.43	Pass	Needs Review
E. COLI	*Normal*				*Normal*			
	Duplicate				*Duplicate*			
	Mean of R_{log}	0.29	Pass	Needs Review	*Mean of R_{log}*	0.36	Pass	Needs Review
BLANK	*Field Blank # 52*		Pass	Needs Review	*Lab Blank # 60*		Pass	Needs Review

Mean = Mean of Normal and Duplicate, which is then compared to the individual corresponding CI's to determine acceptability of data.
Xave = Mean of Normal and Duplicate, which is used as part of RD% formula.
Pass[1]= Lab Duplicates pass only when RD%<2

Light gray fields to be filled in during field run set up.
Unshaded fields to be filled in during sample processing, result analysis, and for incubator QA

Sampler Signature / Date / Time Arrived in Lab:	Placed in Incubator By / Date / Time:	Trays Read By:
Processer / Date / Time:	**Pulled from Incubator By / Date / Time:**	**Distribution:** Original: to CLG for QA Tracking and Originals Binder; Copy: to Data entry; Copy: to Project Managers, as needed

NOTES:

Appendix 10. Excelchem Environmental Laboratories (Chain of Custody)

Excelchem
Environmental Labs

1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765
Ph: 916-543-4445 Fx: 916-543-4449

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager:	Phone #:	Electronic Data Deliverables Request: ☐ .PDF ☐ Geotracker (Global ID) ____________ ☐ Other (please specify) ____________
Company/Address:	Fax #:	Email Address:
Project Number/P.O#:	Project Name:	**ANALYSIS REQUEST** Page ___ of ___
Project Location:	Sampler Name and Signature:	Bin#: / Due Date: / Work Order:

Sample ID	Sampling		Container					Method Preserved				Matrix																	Wet / Total									
	Date	Time	VOA	SLEEVE	1L GLASS	PLASTIC	Tedlar or SUMMA Canister number	HCl	HNO_3	ICE	NONE / OTHER	WATER	SOIL	AIR	BTEX/TPH as Gasoline (602/8021/8015m)	TPH as Diesel (8015m)	TPH as Oil (8015m)	Total Oil & Grease (SM-18th Ed 5520B,F/1664)	Pesticides (608/8081A) - PCBs (8082)	Organophosphorus Pesticides (8141)	Chlorinated Herbicides (8151)	Semi Volatiles (8270C)	VOC Full list (8260B)	MTBE (8021/8260B) circle the method	Methanol (8015m) Ethanol (8260B)	5 Oxygenates (8260B)	Lead Scavengers DCA/EDB (8260B)	Tphg/BTEX/5 Oxygenates (8260B)	Metals -	Metals -	Metals -	Nitrate, Nitrite, Ammonia, Kjeldahl	Chloride, Sulfate, Sulfide, ph, conductance				Requested TAT: 12hr/24hr/48hr/72hr/1wk	LAB USE ONLY:

Relinquished by: (sign and print)	Date	Time	Received by: (sign and print)	Remarks/Condition of Sample:
Relinquished by: (sign and print)	Date	Time	Received by Laboratory: (sign and print)	Bill To:

Appendix 11. Excelchem Environmental Laboratories QA/QC Manual

Excelchem Environmental Laboratories

Quality Assurance and Quality Control
Manual

Initial release date - 1990
Revision – June - 2011

Appendix 12. SWAMP QAPP

SWAMP
Surface Water Ambient Monitoring Program

Final Technical Report	2008

Quality Assurance Program Plan

Version 1.0

September 1, 2008

Surface Water Ambient Monitoring Program

California Water Boards

www.waterboards.ca.gov/swamp

Appendix 13. ASWA Procedure Manual

PROCEDURES MANUAL FOR WATER QUALITY MONITORING BY THE AG AND SURFACE WATER ASSESSMENT UNIT

Updated April 2010

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